

ARCHIVES OF OTOLOGY.

THE EFFECTS OF NOISE UPON DISEASED AND HEALTHY EARS.

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IN the collected works of Doctor of Medicine Thomas Willis, published in Amsterdam, a little more than two hundred years ago, in a chapter upon the sense of hearing, and in a paragraph relating to deafness caused by relaxation of the membrana tympani, there is an account of a somewhat famous woman, who could only hear the voice of her husband when a servant was beating a drum in the same room.¹

Although this passage is often alluded to, it is seldom quoted. No apology will, I think, be required for a translation of it.

“Although hearing is very little produced by the membrana tympani as compared with the proper organ of the sense, yet it so far depends upon it, that deprivation or diminution of that sense not infrequently proceeds from its injury or impeded action. Indeed, a certain kind of

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¹ The original reads as follows :

Quaquam auditus à tympano, velut proprio sensionis organo, minime peragitur, tamen iste in tantum ab hoc dependet, ut non raro à tympani actione læsa, aut impedita sensus illius privatio, aut diminutio procedat. Enimvero surditatis species quædam occurrit, in qua licet affecti auditus sensu penitus carere videantur, quam-diù tamen ingens fragor, uti bombardarum, campanarum, aut tympani bellici, prope aures circumstrepit, adstantium colloquia distincte capiunt, et interrogatis apte respondent, cessante vero immani isto strepitu, denuo statim obsurdescunt. Accepi olim à viro fide digno, se mulierem quæ licet surda fuerat, quousque tamen intra conclave tympanum pulsaretur, verba quævis clarè audiebat; quare maritus ejus Tympanistam pro fervo domestico conducebat, ut illius ope, colloquia interdum cum uxore sua haberet. Etiam de alio Surdaastro mihi narratum est, qui prope companile degens, quoties una plures campanæ resonarent, vocem quamvis, facile audire, et non alias potuit. Proculdubio horum ratio erat, quod tympanum in se continuo relaxatum, soni vehementioris impulsu ad debitam tensitatem, quo munere suo aliquatenus de fungi potuerit, cogeretur.

deafness occurs, in which, although the patients seem completely to lack the sense of hearing, yet so long as a great din, such as that of bombardments, or of chimes of bells, or of drums, resounds about their ears, they take in distinctly the conversation of those about them, and answer questions intelligently, but, upon the ceasing of such tremendous uproar, they immediately become deaf again. I once had it from a trustworthy man, that he had been acquainted with a woman, who, although she was deaf, would, nevertheless, distinctly hear whatever was said so long as a drum was beaten within the room, and consequently her husband employed a drummer as a household servant, in order that by his aid he might occasionally hold conversations with his wife. I have also been told of another deaf person, living near a bell-tower, who could easily hear any voice whenever the bells were pealing—but not otherwise. Doubtless the reason of these things is, that the membrana tympani, habitually relaxed when left to itself, was forced by the shock of a sound much more intense than usual to a state of tension sufficient to enable it to perform its function in some degree.”¹

In the two centuries that have followed the narration of Willis's observations, the symptom of hearing better in a noise, has not only been given the name of the author, and is known in our time as *Paracusis Willisiana*, but the facts as stated by the author, have in turn been denied and affirmed, and while many have admitted the truth of the observations, and have conceded that there are some persons with impaired hearing who hear better in a noise, Willis's explanation of the phenomenon has been rejected by them. I doubt, if in this audience of physicians, there would be found any great unanimity of opinion on this subject. The writers on aural medicine who allude to it at all, are by no means agreed upon the facts nor upon their explanation. Wilde² admits the credibility of Willis's cases, and argues against the notion of Kramer

¹ *Opera Omnia, Amstelædamia., apud Henricum Wetstenium. Pars physiologica, Cap. xiv, p. 69.*

² “Aural Surgery,” English edition, p. 289.

that the auditory nerve became so excited by these loud sounds as to be able to do its work better. Wilde explains the phenomenon by reference to the state of the membrana tympani, and says that it is remarkable that it does not occur in cases where that structure has been in whole or in part removed. Later on, I shall show that Wilde was in error in thinking that it could not occur when there was a hole in the drum-head.

Tröltsch¹ says: "These statements (as to hearing better in a noise) are founded, as a rule, upon a want of exact observation, as well as upon self-deception." He then relates one of Willis's cases, and also one reported by an author named *Ficlitz*. The latter was that of a deaf son of a shoemaker, who could only hear conversation in the room, when he stood near his father and the latter pounded sole leather upon a large stone. This same boy, heard well in a mill when it was in action.

I cannot agree with Tröltsch, in his idea that the symptom of hearing better in a noise is not a common one. As I have said, on several occasions, my own experience has proven that it is a very frequent one. During the subsequent part of this paper, I shall have an opportunity of making my statement good. *Rau*,² like Kramer, believed that better hearing in a noise depends upon excitement of a torpid acoustic nerve. In somewhat poetic style, he says: "If the auditory nerve be awakened from its slumber by loud talking, the patient will momentarily hear even words spoken in a low tone very well. This sometimes goes to such an extent, that the hearing is temporarily restored, to a considerable degree by a loud and regular sound, for example, during the pealing of bells, drumming, a ride in a rattling wagon, or the like." Burnett,³ of our own country, is positive that the symptom is a real one, but confines it to the later stages of chronic aural catarrh, "when the condition of the tympanum has become dry or sclerotic, or when the thickening of the mucous membrane has become great in the moist form."

¹ Tröltsch, Lehrbuch, 6 Ausgabe, p. 253, passim.

² Lehrbuch, p. 292.

³ "Treatise on the Ear," p. 386.

Dr. E. E. Holt¹ doubts if, in any case the hearing-power is improved by noise, and he states that, so far as he is aware, no one has "ever made a careful investigation to ascertain whether the claim of such persons was a real one or not."

In the first edition of my book upon the ear, and in all the subsequent editions, I related from my personal experience the case of a mail agent, on one of our railways, who, although very hard of hearing in a quiet place, could hear very well in his car amid the noise of a train. I have had frequent opportunities to study this case, and there is no question as to the facts. No person who did not know of this gentleman's infirmity would ever suspect him of impaired hearing while conversing in the din of a rapidly-going train of railway carriages. But the instant he reached a quiet place, it was with the greatest difficulty that he could hear loud conversation specially addressed to him.

Politzer, in his great treatise, not long since published in German, and very recently translated into English, has no doubts as to the existence of these cases, and confirms what was stated by me years ago, "that the patients can understand speech during such noises much easier, and at a much greater distance, than people with normal hearing."² Politzer, however, states that he has observed this symptom "almost exclusively in the incurable forms of affections of the middle ear."

I have known of two cases where this symptom occurred, in patients who regained their hearing perfectly. While the symptom frequently accompanies incurable disease of the middle ear, I believe it is a very frequent symptom in sub-acute cases, when both ears are affected. Of course, it would not be observed in disease of one ear only. I also have two cases under observation in which the drum-heads are entirely, or nearly removed, and yet these patients hear well in a noise. One of these, I published in the fourth edition of my book. While the occurrence of the symptom in sub-acute cases disposes of the notion, that hearing better in a

¹ Transactions of American Otological Society, 1882.

² Lehrbuch, p. 233.

noise implies an incurable disease, the fact that it also may exist when the *membrana tympani* is gone, shows that Willis's explanation of the phenomenon is not exclusively, if at all, correct. I have never yet seen the symptom except in disease of the middle ear. I believe it never occurs except in cases where the nerve is sound. I have looked over my cases with great care as to this point, and I have yet to see a patient who had, as I supposed, disease of the acoustic nerve, and who yet heard better in a noise. If this be true, the theory of an extraordinary excitement of the nervous apparatus, as a cause of the phenomenon, must be rejected. Politzer explains the symptom by a reference to some effect upon the *ossicula auditus*, made by the great din.¹ This is the only theory, incomplete as it is, which fulfils the conditions made by such cases as those just mentioned, where, although the *membranæ tympani* were gone, the *ossicula* were intact. How the ossicles are affected is a problem yet to be solved, but when it is solved, it will be possible to invent an instrument to enable those deaf from disease of the middle ear, to hear conversation not only in a noise, but in the quiet of an ordinary room. This latter will, certainly, not be a task beyond the capabilities of a physicist of the 19th century.

The statement, that these cases rest upon inexact observations, will soon be disproven by a ride of a few miles in a railway carriage or in a clattering wagon, with a person deaf from disease of the middle ear, to ordinary conversation in a quiet place. Examinations of boiler-makers, or of those who suffer from affections of the acoustic nerve, will, however, be disappointing, and will lead, as in Dr. Holt's paper, from which I have already quoted, to a doubt in the mind of the observer as to the reality of the symptom. I now quote one of the cases in which the hearing was better in a noise, and which was one of sub-acute catarrh of the middle ears, from which the subject fully recovered under my observation. The writer of his own case is now a practising physician in this city. At the time of the occurrence of the disease he was a boy in school, and I reported his case, except as to the symptom now under discussion, in the *American Jour-*

¹ See also A. H. Buck, *Medical Record*, July 5, 1875.

nal of Medical Sciences and in my text-book. Dr. B. writes to me as follows:

"With regard to the disputed fact of many deaf persons hearing conversation better in noisy places, I wish to give in brief my experience. For several years previous to my sixteenth, I had been much troubled with varying degrees of deafness, due, as I then heard and now understand, to acute catarrh of the middle ear, complicating general pharyngeal catarrh. At school I was at a great disadvantage, suffering at times great embarrassment on account of my limited hearing. Living far up-town, I was in the habit of being driven home or to the doctor's by my mother. When surrounded by the noise of wheels and glass, I invariably had occasion to request a moderation of her voice; and she not infrequently made the remark: "How well you hear in the carriage!" Furthermore, on several occasions, my parents were surprised to find that they could not safely carry on a confidential conversation requiring only sound enough to suffice their own hearing powers, while in a quiet room their talk would have been unintelligible.

"This is only an echo of the experience of many deaf people I have questioned on the subject."

The other case was that of a student of seventeen years of age, and is so similar to the one just given that I simply allude to it. As I have already intimated, the power of hearing better in a noise is a different subject, from that of the effect of certain noisy occupations upon the ear. Patients like my friend, the mail agent, may travel for years in the din of a train, and always find their hearing improved and not decreased, so long as it depends upon disease of the middle ear. Neither do I know of any cases of deafness that have been caused by such occupations. But although there is a class of patients who have been made deaf by noise, often confounded with those whose impairment of hearing has resulted from catarrh, they should be entirely disassociated from them. Boiler-makers, and those who become deaf from an exposure to the continuous shock of loud sounds, suffer a lesion of the acoustic nerve. These patients do not hear better in a noise, but they have a source of

relief in quiet places, and, like ordinary people, they hear better away from the din that is such a comfort to a person deaf from many forms of disease of the middle ear.

I must confess to have assisted in the creation of confusion in our ideas as to hearing better in a noise, and the effects of noise upon the ear. In 1874, in an article upon diseases of the internal ear,¹ and a few months subsequently in my book,² I gave the results of my examinations of a certain number of boiler-makers, and I incidentally assumed that they heard better in the noise of their occupations. When the paper by Dr. Holt, to which I have referred, appeared, I found that he denied the correctness of my main conclusions; that is, that the impairment of hearing in boiler-makers is generally a result of a lesion of some part of the labyrinth, and that, besides his doubt that any deaf person, much less boiler-makers, ever heard better in a noise, he was inclined to attribute their impairment of hearing to a disease of the middle ear. I then made a new series of examinations upon boiler-makers, assisted by Dr. J. B. Emerson. As a result of these recent investigations, which were undertaken with the much better means of a differential diagnosis between diseases of the middle and internal ear, now at our command, I find that I cannot agree with Dr. Holt's conclusions, except in one particular, and that is the one just mentioned, *i. e.*, that boiler-makers do not hear better in a noise. This incidental statement made by me, I now find to be entirely incorrect. But that boiler-makers do suffer from a lesion of the internal ear, and not of the middle ear, in so far as they have a peculiar affection from their occupation, I do not think admits of a doubt. The very fact that they do *not* hear better in a noise is an incidental proof that they suffer from a lesion of the labyrinth. Boiler-makers, like men in other occupations, often have impacted cerumen, and occasionally catarrh of the middle ear, but the disease caused by their occupation, "boiler-makers' deafness," in my opinion, is easily shown to be a disease of the labyrinth.

¹ *American Journal of the Medical Sciences*, vol. lxviii, p. 381.

² "Diseases of the Ear," fourth edition, p. 509.

Other occupations of a similar nature, that is, occupations amid continuous concussions, undoubtedly cause the same lesion. A recent visit to an establishment where two engineers were employed for the production of electric light, showed me that they had become somewhat hard of hearing, since they had been engaged in an occupation exposing them to the sound of regular concussions from the striking of metallic plates together.

The confusion which I assisted in producing upon the subject, was not, however, as regards the seat or cause of the aural lesion, but as regards the ability of these workmen to hear better in the din in which they labor. It will perhaps be remembered that in the earlier part of this paper, I stated that those who hear better in a noise always suffered from some form of disease of the middle ear. When some years of observation had convinced me of the uniformity of this rule, I was puzzled to account for my cases of so called boiler-makers' deafness, which, in my paper upon this subject, I had assumed were also improved by being in a noise. I had said: "It will be observed that the subjects of it (boiler-makers' deafness) hear very well in the tremendous din of a boiler-shop, while they are quite deaf in an ordinarily quiet place."¹ This remark, I am constrained to say, although in my text-book, is strikingly incorrect. Boiler-makers, as we should naturally believe, are no exception to the rule, that those who have disease of the nerve hear worse in a noise. Boiler-makers hear so badly in their shops that they have a language of signs that is quite elaborate, called a "boiler-maker's language." They hear no better in a noise than do people with sound ears; on the contrary, they hear better in a quiet place.

If, however, a person deaf from disease of the middle ear, who hears better in the noise of a railway train, enters a boiler-shop, that person will hear better than the boiler-makers, or than persons with sound ears.

It is only very recently that I have been able to send a patient suffering from chronic disease of the middle ear, who heard well in a railway carriage, to a boiler-shop. I had predicted, that although boiler-makers with disease of the

¹"Treatise on the Ear," p. 510.

acoustic nerves, and persons with sound ears, hear very badly in the dreadful din, such a patient would hear well in such a place.

The patient whom I sent, is a lady of about thirty years of age, who has had chronic disease of the middle ears, of the proliferous form, for many years. She cannot hear the watch at all, and conversation only when directed into the ear, and then with difficulty. In the cars she hears very well. She only hears the tuning-fork by bone-conduction. Her account of the experiment is as follows:

"I went with my husband (he has excellent hearing) this afternoon to the boiler-shops of the Dickson Co. (Scranton, Pa.), where the noise is perfectly deafening. I could distinctly hear what my husband said, although he purposely spoke in a low tone, while *he* could not hear a word I said, unless I put my mouth to his ear and screamed. I think, perhaps, cars and boiler-shops are the places for me to live." In a subsequent note she informs me that she could not hear the watch tick, although she hears conversation so easily.

In this case it will be noted that the improvement does not depend upon the loud tone of the speaker.

Boiler-makers speak in graphic language of the effects of the din upon their ears. Said one of them to me: "Those heavy hammers jar every nerve in the body." They do not find much relief from wearing cotton in their ears, except when first entering the shop. An experienced workman, however, told me that all old boiler-makers had learned to equalize the pressure and reduce the shock by opening the mouth frequently. Of course, by this procedure they open the Eustachian tube more freely.

My reasons for contending that the lesion in these cases is situated in the nerve predominantly, are that the aërial conduction was always louder than the bone-conduction, as tested by the tuning-fork "C," and that it was heard longer than by bone-conduction. The only apparent exceptions to this rule were those in which, in addition to the lesion of the acoustic nerve, there was also inspissated cerumen. When the wax was removed however, and the cases were

transposed into their proper place, of diseases of the acoustic nerve produced by concussion, the tuning-fork was heard through the air louder and longer than through the bone. I consider all the other tests that we as yet have, for the differential diagnosis of affections of the middle and internal ear, as so much inferior to this, although of great corroborative value, that I am constrained to consider all observations upon boiler-makers that have not been made in this way, as so defective as to tell nothing of the true seat of the disease. As has been suggested by many writers, there is no doubt that something might be done to avert the consequences of those concussions in producing disease of the acoustic nerve, if workmen could be induced to wear ear protectors, but from some reason or other, they are, as a rule, quite averse to wearing cotton in their ears, or any contrivance for protecting their ears from the effects of a great and constant concussion. Almost all boiler-makers say that they were deafer at first than after they had become accustomed to the occupation; and they all say that they hear better after a period of rest, say from Saturday to Monday.

That excessive sound must necessarily be as harmful to the nerve of hearing, as is excessive light to that of sight, is a natural deduction from our knowledge of the effects of the waves that produce those two senses, and all experience confirms the belief that there may be an acoustic neuritis produced by noise, as well as an optic neuritis caused by exposure to a glare.

The fact that most patients suffering from disease of the middle ear hear better in a noise, especially that of a railway car, I find as a result of a series of examinations extending over many years, and embracing several thousands of cases. Wherever this symptom is not present, I have found that either the disease was primarily or secondarily one of the labyrinth or acoustic nerve.

I have gone with such patients to a train in motion, and I have always found their statements correct. From hearing a voice with difficulty directly in the ear, they have been enabled to hear it twenty feet, that is to say to hear conver-

sation at that distance and with ease. In my experience they do not always hear a watch tick farther, but most of these marked subjects hear a watch a very short distance, if at all, in a quiet place. There is, I think with Politzer, sometimes an improvement in this respect also.

This symptom would often be found in acute disease of both sides did such diseases last long enough to admit of proper tests. To say that the whole explanation is to be found in the fact that the voice is raised when in a noise, is to forget that even in a quiet place, with just such an elevation of the voice, these patients do not hear as well as they do in the noise. Besides, the elevation in the voice is usually only slight, and sometimes it is not at all raised.

I have yet to find a case where a mistake was made in a deliberate statement by a patient, that conversation was heard better in a noise. When the symptom does occur, it is so marked that no mistake can be made. When a patient does not know whether he does or does not hear better in a noise, we may assume that he does not, and when he does not, the case will, I think, always be found to be one in which the nerve is somewhat involved.

The cases upon which my conclusions as to boiler-makers' deafness depend are as follows :

CASE 1.—Boiler-maker twenty years; disease of acoustic nerve.

John F., æt. thirty-five. Has been in the business for twenty years. Hearing was good when he began; began hearing noises in his ears; then became hard of hearing gradually. Cannot now hear a lecture. Does not hear better in the noise of the shops, but he assists his ears by watching the lips of those speaking to him. Was most deaf after working in a boiler. Did not use cotton, because it made him worse when removed. Hissing tinnitus all the time.

| | Duration Air. | Duration Bone-, in seconds. |
|--|---------------|-----------------------------|
| H R = $\frac{P}{48}$, aerial cond. best | 23 | 11 |
| H L = $\frac{3}{48}$ " " " | 20 | 9 |
| M T Rt, good color; good light spot, not sunken. | | |
| M T Lft, sunken; 2 light spots, good color. | | |
| Says that he has never had catarrh. | | |

CASE 2.—*Boiler-maker thirty years. Disease of acoustic nerve.*

X. Y., forty-six years of age. Has been in the business for thirty years. Hearing was good when he began his work. Now cannot hear well when spoken to. Thinks he hears better in a noise, because people speak louder. No pain at any time, but has noises, and hearing failed gradually. Has used cotton, but does not like it.

H R = $\frac{P}{48}$, aërial cond. best; watch not heard on mastoid.

| | | | | |
|----------------------|--------------|------------------------|---|---|
| H L = $\frac{L}{48}$ | " | " | " | " |
| | Aërial cond. | Bone-cond. in seconds. | | |
| Rt, | 26 | 12 | | |
| Lft, | 21 | 8 | | |

M T Rt, opaque; no light spot, vascular along handle of the malleus.

M T Lft, opaque; sunken, no light spot.

Pharynx sound.

CASE 3.—*Boiler-maker twenty-four years. Disease of nerve one side, of the middle ear and nerve on the other.*

Forty-seven years of age. Has been in the business twenty-four years. Hearing was good before he began it. Sissing tinnitus. Deafness came on gradually, but was worse when he was "holding on"; no pain. Cotton did no good.

H R = $\frac{0}{48}$, aërial but no bone-conduction.

H L = $\frac{0}{48}$ " feels something; bone-cond. distinct.

| | | |
|----|-----------------|---------------|
| | D. Aërial cond. | D. Bone-cond. |
| R, | 6 | 0 |
| L, | 0 | 12 |

M T R, opaque rim; vascular malleus; no light spot.

M T L, good color; vascular malleus; no light spot.

Pharynx catarrhal; uvula elongated.

CASE 4.—*Boiler-maker twenty-four years. Disease of acoustic nerves.*

Fifty-one years of age. Has been in the business twenty-four years; previous to which his hearing was very sharp, now is very poor. Sissing tinnitus; does not hear any better in the shop or car. Wears cotton at times. No pain in ear. Health good. Voice at 4 feet.

H R = $\frac{0}{48}$, aërial feeble ; no bone-cond.

$$HL = \frac{P}{48} \quad " \quad " \quad " \quad "$$

D. Aërial.

D. Bone.

R, 5 0

L, 6 o

M T R, opaque (wax).

M T L, opaque on periph. ; no light spot.

Pharynx in good condition.

CASE 5.—*Boiler-maker twelve years. Disease of acoustic nerve.*

Æt. twenty-five. Has been in the business twelve years. Hearing is good ; no pain or noises.

D. Aërial.

D. Bone.

H R = $\frac{6}{48}$, aërial best. 21 7

H L = $\frac{18}{48}$, " " 20 10

M T R, good light spot; opaque on periph. and above.

M T L, " light spot ; opaque.

Catarrhal pharynx.

CASE 6.—*Assistant in boiler-shop for one and a half years.*

Works ten hours a day. Thinks his hearing is good enough. Hears ordinary conversation with his face away from the speaker about twenty feet.

H D, R ear, aërial conduction louder, air 10, B 5

" L, 10, " " " " 16, B 4

Memb. tym., R, small light spot, opaque.

“ “ L, “ “ “ vascular.

Pharynx healthy.

CASE 7.—*Boiler-maker thirteen years. Disease of middle and internal ears.*

Has been in the business thirteen years. Hearing always good. Never protected his ears. Had a pain in left ear once, but no discharge. Whispers heard by others not heard by him. Does not hear better in noise.

D. Air. D. Bone.

| | | |
|---|----|---|
| H R = $\frac{L}{48}$, bone-cond. best. | 10 | 9 |
|---|----|---|

$$H L = \frac{P}{48} \quad " \quad " \quad " \quad 13 \quad 7$$

M T R, good color and light spot.

M T L, sunken, opaque ; small light spot.

Tonsil enlarged. Pharyngitis.

CASE 8.—*Æt. eighteen. Boiler-maker for fifteen months. Disease of acoustic nerve.*

Has been in business fifteen months. Hearing good when he came. Not so good now. Hissing tinnitus. No pain. Does not hear better in noise.

| | | D. Aërial. | D. Bone. |
|---------------------|---|------------|----------|
| H R | = $\frac{5}{48}$ aërial best | 12 | 9 |
| H L | = $\frac{1}{48}$ " " | 14 | 7 |
| M T R, | small light spot ; prominent short process. | | |
| M T L, | no light spot ; | " | " |
| Slight pharyngitis. | | | |

CASE 9.—*Thirty years a boiler-maker. Inspissated cerumen ; disease of acoustic nerve.*

Æt. forty-nine. This subject is what is technically called a "holder-on." His duties keep him inside of the boiler holding on to the rivets. The shock of sound is much greater here than in the open air of the shop. Thirty years a boiler-maker. Three and a half years in navy. Ears were good when he went into the present business. Hears better when he gets away from noise. Voice, 6'. Watch, $\frac{0}{48}$, each side.

Tuning-fork :

| R. E. | | | | L. E. | | | |
|-------|---|--------|---|-------|---|--------|---|
| A | C | Louder | 8 | A | C | Louder | 8 |
| B | C | " | 3 | B | C | " | 4 |

Inspissated cerumen on each side. After removal of large plugs of very hard wax, H D for the voice increased to 18', and the watch was heard, when pressed on each side, $\frac{P}{48}$. The duration of the aërial conduction was increased, but no change in the intensity with which it was heard.

It is interesting to note in this case, that the aërial conduction was louder and longer, even when the ear was plugged with wax. This shows a more marked lesion of the nerve, than the other cases in which inspissated cerumen was found—for in these latter the bone-conduction was better until the wax was removed, when the aërial conduction was found to be as is usual in those suffering from *boiler-makers' deafness*.

CASE 10.—*Boiler-maker thirty-one years. Disease of acoustic nerve.*

James L., forty-seven. Boiler-maker thirty-one years. First job was a riveter, and in twenty days could not hear well; tinnitus like bees; never had earache; healthy; rheumatism; voice 20'.

R $\frac{8}{48}$, L $\frac{8}{48}$. Aërial conduction better each side.

R, aërial, 12 sec. Bone-, 8 sec.

L " 9 " " 9 "

R M T, Good light spot. Good lobe.

" " " " "

Both opaque on periphery.

Healthy pharynx.

CASE 11.—*Boiler-maker for twenty years. Inspissated cerumen removed from both sides; disease of acoustic nerves.*

Æt. thirty-nine. Has been twenty years in the business. Ears were sound when he began; had an occasional earache as a boy. He can't hear a whisper; does not hear well in a boiler-shop. Watches the mouth and gestures. Hears the voice in a quiet room 40'. Watch, R $\frac{0}{48}$, L $\frac{0}{48}$; R side the aërial conduction is better. On the left *the bone-conduction is better*.

R, Aërial conduction is heard 12 seconds.

Bone- " " 6 "

L, Aërial " " 12 "

Bone- " " 8 "

Pharynx is sound.

Inspissated cerumen is found on each side. After it is removed the watch is heard better on each side; e. g., R $\frac{P}{48}$, L $\frac{P}{48}$. Relative distinctness of bone- and aërial conduction not changed. Duration of the sound about as before.

CASE 12.—*Boiler-maker twenty-five years. Inspissated cerumen; both sides. Disease of acoustic nerves.*

Æt. forty-three. This man has been a boiler-maker twenty-five years. He had good hearing when he began his work. Never had an earache. Hears the voice in a quiet room 30'. Watch $\frac{Laid}{48}$ on right side, $\frac{4}{8}$ on left side. R side, *Bone-conduction much more distinct*; L side, the same.

Duration : R aërial conduction, 5 seconds ; bone, 12 seconds. Left side, aërial, 14 seconds ; bone-, 11 seconds. Inspissated cerumen, each side, removed. After removal of wax watch was heard $\frac{3}{40}$ and $\frac{4}{40}$ on the right and left sides respectively, instead of $\frac{C}{40}$ and $\frac{P}{40}$. *The aërial conduction became better in each ear.* Duration as follows : R, aërial, 18 seconds ; bone-, 13 seconds ; L, aërial, 22 seconds ; bone-, 12 seconds.

As is seen, the peripheric trouble (inspissated cerumen) masked the disease of the acoustic nerve in this case, but when the wax was removed, the lesion of a boiler-maker's ear was found to exist.

In case number seven, the bone-conduction was decidedly louder than the aërial, but the tuning-fork was heard much longer through the air than through the bone. The left drum-head was sunken and opaque, and there was considerable throat trouble. From these data, I conclude that there is disease of the *middle* as well as of the internal ear in that case.

From all the observations I have been able to make upon this subject, I think, I am justified in drawing the following conclusions :

1. There is a large class of people suffering in quiet places, from impairment of hearing, who hear very acutely and with comfort amid a great din or noise.

2. The disease causing the impairment of hearing thus relieved is situated in the middle ear. It is usually observed in the chronic, non-suppurative form of disease of the middle ear, but it may also be found in acute or sub-acute catarrh of this part, as well as in a chronic suppurative process with loss of the whole or a part of the membrana tympani.

3. The proximate cause of this phenomenon is not as yet positively known. It is probably to be found in some change in the action of the articulations of the *ossicula auditus*.

4. The hearing-power of persons working in such a din as that of a boiler-shop invariably becomes impaired.

5. The lesion caused by this occupation is one of the labyrinth, or of the trunk of the acoustic nerve.

6. Persons thus affected do not hear better in a noise. Their hearing-power is better in a quiet place, and becomes better after prolonged absence from the exciting cause of their impaired hearing.

7. The cases of inspissated cerumen, catarrh of the middle ear, occurring among boiler-makers, are such as occur among those employed in various occupations and only mask and complicate the fundamental primary trouble, so long known as boiler-makers' deafness.

8. In diseases of the labyrinth or acoustic nerve the tuning-fork "C" is heard louder and longer through the air than through the bones of the head.

For an account of my first examinations of the hearing of Boiler-makers, the reader is referred to my work on the Ear, edition of 1877, and to the *American Journal of Medical Sciences*, 1874.

TABLE SHOWING THE RESULT OF THE EXAMINATION

| Length of Time a Boiler-maker. | Hearing Dis- tance. | Aërial Con- duction. | Bone - Con- duction. |
|-----------------------------------|--|---|---|
| Case 1, 20 years . . | Cannot hear ordinary con- versation. R $\frac{\text{Pressed}}{48}$, L $\frac{3}{48}$ | Better than bone. | — |
| " 2, 30 " . . | R $\frac{0}{48}$, L $\frac{\text{Laid}}{48}$ | " | — |
| " 3, 24 " . . | R $\frac{0}{48}$, L $\frac{0}{48}$ | " | None on right side. |
| " 4, 24 " . . | Voice 4 feet. R $\frac{0}{48}$, L $\frac{P}{48}$ | Feeble. | — |
| " 5, 12 " . . | R $\frac{6}{48}$, L $\frac{12}{48}$ | Better than bone. | — |
| " 6, 1 $\frac{1}{2}$ " . . | Voice 20 feet. R $\frac{7}{48}$, L $\frac{10}{48}$ | " | — |
| " 7, 13 " . . | R $\frac{\text{Laid}}{48}$, L $\frac{\text{Pressed}}{48}$ | — | Better than aërial. |
| " 8, 15 months . | R $\frac{5}{48}$, L $\frac{12}{48}$ | Better than bone. | — |
| " 9, 30 years . . | Voice 6 feet. R $\frac{0}{48}$, L $\frac{0}{48}$ | " | — |
| " 10, 31 " . . | Voice 20 feet. R $\frac{\text{Laid}}{48}$, L $\frac{8}{48}$ | " | — |
| " 11, 20 " . . | Voice 40 feet. R $\frac{1}{48}$, L $\frac{0}{48}$ | Better on right side af- ter removal of wax. | Better on left side. |
| " 12, 25 " . . | Voice 30 feet. R $\frac{\text{Laid}^2}{48}$, L $\frac{1\frac{1}{2}}{48}$ | Better on each side af- ter removal of wax. | Better <i>un- til</i> wax was removed. |

¹ $\frac{\text{Pressed}}{48}$ after removal of wax.² $\frac{3}{48}$ and $\frac{4}{48}$ after removal of wax.

OF TWENTY-FOUR EARS OF TWELVE BOILER-MAKERS.

| Duration of Aërial and Bone-Conduction. | Diagnosis. | Remarks. |
|--|--------------------------------------|---|
| R E, 23 sec., Aërial : L E, 20 sec., Bone : | Disease of internal ears. | Has hissing tinnitus. |
| R E, 11 " " 9 " | | |
| R E, 26 " Aërial : Bone : 21 " | " | — |
| R E, 10 " " 8 " | | |
| R E, 6 " Aërial : Bone : 0 " | Disease of internal and middle ear. | Pharynx catarrhal ; uvula long ; <i>mt.</i> vascular along malleus. |
| R E, 0 " " 12 " | | |
| R E, 5 " Aërial : Bone : 6 " | Disease of internal ears. | — |
| R E, 0 " " 0 " | | |
| R E, 21 " Aërial : Bone : 20 " | " | Thought he heard very well. |
| R E, 7 " " 10 " | | |
| R E, 10 " Aërial : Bone : 16 " | " | " |
| R E, 5 " " 4 " | | |
| R E, 10 " Aërial : Bone : 13 " | Disease of middle and internal ears. | Left <i>mt.</i> sunken ; small light spot ; pharyngitis. |
| R E, 9 " " 7 " | | |
| R E, 12 " Aërial : Bone : 14 " | Disease of internal ears. | Slight pharyngitis. |
| R E, 9 " " 7 " | | |
| R E, 8 " Aërial : Bone : 8 " | " | Inspissated cerumen, each side. |
| R E, 3 " " 4 " | | |
| R E, 12 " Aërial : Bone : 9 " | " | — |
| R E, 8 " " 9 " | | |
| R E, 12 " Aërial : Bone : 12 " | " | Inspissated cerumen, each side. |
| R E, 6 " " 8 " | | |
| R E, 5 " Aërial : Bone : 14 " | " | — |
| R E, 12 " " 11 ¹ " | | |

¹ After removal of wax, aërial became R E, 18 seconds, L E, 22 ; bone remains nearly the same : R, 13 seconds, L, 12.

CALCIUM SULPHIDE IN AURAL DISEASES.

By GORHAM BACON, M.D.,

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THAT calcium sulphide is one of the most valuable drugs we possess in the treatment of aural diseases, especially those attended with suppuration, I think no one will deny who has given the drug a fair trial. Dr Sexton, I believe, was the first to advocate its use in diseases of the ear, in an article published in the January number of *The American Journal of Otology* for 1879. During the past two years I have used the drug in both dispensary and private practice, and have been much pleased with the results obtained. Ringer, in his work on "Therapeutics," says: "The sulphides appear to me to possess the property of preventing and arresting suppuration. Thus, in inflammation threatening to end in suppuration, they reduce the inflammation and avert the formation of pus. After the formation of pus, the influence of this group (sulphides) on the suppurative process is still more conspicuous; then the sulphides hasten maturation considerably, whilst at the same time they diminish and circumscribe the inflammation, promote the passage of pus to the surface, and the evacuation of the abscess." "In boils and carbuncles these remedies yield excellent results. When the skin is not yet broken and the slow-separating core not yet exposed, the sulphides often convert the boil into an abscess, so that, on bursting, pus is freely discharged, and the wound at once heals; or if the centre of the hardened, swollen tissues is not yet dead, the pustule dries up, the inflammation subsides, and a hard knot

is left, which disappears in a few days without the formation of a core and without any discharge. These remedies, meanwhile, improve the general health, removing that debility and malaise so markedly associated with boils and carbuncles." Ringer goes on to say that in children of a strumous diathesis, where the phalangeal bones are affected, the sulphides will benefit considerably, especially in those cases where the shaft is found enlarged, very pale, and the cancellous structure infiltrated with straw-colored firm substance.

In most of the cases of acute otitis media in which I have used the calcium sulphide, suppuration had already commenced, but in several, where the mem. tympani was highly congested and bulging, all the inflammation subsided under the use of this remedy, and I believe that it will prevent the formation of pus in many cases, if given sufficiently early in the course of the disease. Its most decided action seems to be in those cases of otitis media in which the discharge has already commenced, as well as in cases of furuncles in the ext. auditory canal, where it will either arrest the inflammation and cause the boil to dry up, or it will promote suppuration and cut short the disease. Those patients subject to furuncles are generally badly nourished and in poor health, which is an indication for the administration of the drug.

The pain so frequent in these diseases, even when the periosteum is involved, is often relieved at once. In diffuse inflammation of the ext. auditory canal, and in mastoid disease, whether affecting the pneumatic cells or the periosteum and tissues externally, great benefit will be obtained from its use. I would not hesitate, however, to perform paracentesis where severe pain was caused by bulging of the mem. tym.; nor in cases of mastoid disease, where there were symptoms pointing to the presence of pent-up pus, and the patient suffering severe pain, with danger of further complications, would I hesitate to perforate the bone. But the fact, that since I have used calcium sulphide in acute inflammation of both middle and external ears, I have had no serious mastoid complication, and have not been obliged to

resort to the knife, I attribute to the early administration of this remedy.

In acute inflammation of the ear, before the formation of pus, I have been in the habit of prescribing aconite for the relief of pain, besides giving the sulphide. Appropriate treatment should be applied to the naso-pharynx and neighboring parts, and particular attention should be paid to the condition of the teeth.

The dose must be adapted to each individual case. In a child, $\frac{1}{10}$ or $\frac{1}{20}$ gr., or even lower, may be used, while in an adult, from $\frac{1}{10}$ to $\frac{1}{2}$ gr. may be given several times a day or every two hours. In some cases a small dose seems to answer better than a larger one, and *vice versa*.

As regards local treatment, where there was suppuration, I have had the best results from the use of powders—either boracic acid or iodoform; or else I have used the boracic acid et calendula, as recommended by Dr. Sexton, or boracic acid et hydrastis canad., prepared as follows: equal parts of boracic acid and tr. hydrastis canad. are thoroughly mixed and evaporated to dryness; then the residue is thoroughly pulverized and mixed again with equal parts of boracic-acid powder.

The following cases are examples of those in which I have found great benefit from the use of calcium sulphide.

CASE I.—A. S., æt. twenty-nine, male, came to the infirmary Mar. 6, 1883. Had a severe pain in the left ear the Saturday preceding; lost the hearing in the right ear in 1863 from typhoid fever; tuning-fork when placed on the vertex heard only in the left ear.

Examination shows: Left *Mt* inflamed in lower portion; macerated in appearance, bulging slightly above. Discharge commenced two days ago, and is slight. He is subject to considerable nasal catarrh, for which he has been using the nasal douche.

Treatment: Calcium sulphide, gr. $\frac{1}{10}$ every three hours; canal insufflated with pulv. acid. boracic. et hydrast. canad. Hearing much affected. Could only hear shouting voice. Watch, $\frac{0}{48}$.

Mar. 9th.—No pain now; hearing the same and appearance of *Mt* unchanged. Calcium sulphide increased to gr. $\frac{1}{4}$.

Mar. 16th.—Hears watch now, $\frac{1}{8}$; no discharge now. Inflation by Politzer's method has been used occasionally.

CASE 2.—Patient, male, æt. forty-five, presented himself Feb. 20th, and gave the following history: The right ear has been discharging and painful for six days; left ear for eight days. No perforation to be seen in left *Mt*, which is bulging.

Treatment: Canals dried with absorbent cotton, and boracic acid insufflated. Calcium sulphide, gr. $\frac{1}{10}$, given.

Feb. 23d.—Discharge less in left ear; in right one about the same. Right auditory canal filled with pulv. acid. boracic. et hydrastis canad.

Mar. 2d.—No perforation seen in either mem. tympani; congestion has disappeared in both except at upper segment, around the short process and manubrium.

CASE 3.—Patient, female, æt. twenty-eight, anæmic, came to infirmary Feb. 13th. She had measles three weeks ago, and both ears have been discharging ever since. Both canals filled with muco-pus. Pulv. acid. boracic. et hydrastis insufflated, and calcium sulphide given; patient very deaf.

Feb. 23d.—Great pain and noise in right ear; same treatment continued.

Feb. 24th.—No pain, but great noises.

Mar. 9th.—Left *Mt* slightly pinkish, and a very small perforation at upper part; no discharge whatever. Right *Mt* slightly congested; no perforation; no discharge. Hearing distance much improved.

Mar. 13th.—No discharge from either ear; both *Mt* clearing up. Hears loud voice in left ear; right normal.

CASE 4.—Patient, female, æt. twenty-two. The history in this case was that four weeks ago the left ear began to ache till the following Thursday, when it broke; it discharged a week and then stopped.

Canal dry, very little discharge. Abscess over the mastoid process with deep-seated fluctuation; considerable swelling and induration of the tissues extending down the neck. Patient very anæmic. No treatment except calcium sulphide, gr. $\frac{1}{10}$, every three hours. She returned the following Friday, and said she was better; to continue same treatment.

Feb. 20th.—Swelling and fluctuation over the mastoid process entirely gone; also the induration in the neck. No discharge from the ear for nearly two weeks; general health and appearance improved.

CASE 5.—Patient, female, æt. nineteen, has chronic pharyngitis. Came to infirmary ten days ago, when I removed inspissated cerumen from her ear. Hearing good, and she had no further trouble till Oct. 21st; both ears then began to pain her, especially the left.

Examination showed: Both auditory canals narrowed and inflamed. The *Mt* could not be seen in either ear, but there were evidences of perforation in the left ear. Calcium sulphide, gr. $\frac{1}{10}$, given.

Oct. 27th.—Both auditory canals free from inflammation and shedding epithelial layer; both *Mt* almost normal in appearance, but slightly congested. Hearing has improved each day; same treatment continued.

CASE 6.—Mrs. H., æt. forty, came to my office Nov. 14th. Has naso-pharyngeal catarrh. She said that three weeks ago the left ear began to feel stuffed up and to itch. Last Friday, commenced to pain her severely, keeping her awake at night. Discharge appeared to-day for the first time.

Examination: Furuncle in left ext. auditory canal, lower portion, which was discharging, and which obscured *Mt*. Canal dried with absorbent cotton and filled with pulv. acid. boracic.; aconite in small doses given for the pain, and pil. cal. sulphid., gr. $\frac{1}{10}$. There were some deafness and autophony Nov. 16th. Pain less yesterday, and last night she slept much better. Acid. boracic. et calendula insufflated, and she was given some of the powder to use herself once every day. Aconite and calcium sulphide continued.

Nov. 20th.—Pain has steadily decreased, and last night there was none. Epithelium desquamating from *Mt* and inner end of ext. auditory canal. Every trace of the furuncle gone. *Mt* very much congested and dull and macerated in appearance. Hearing improved. No autophonous noise to-day. Treatment continued. She continued steadily to improve, and Nov. 24th hearing almost normal.

CASE 7.—J. G., male, æt. four and a half, came to my office April 3d, suffering with severe earache. The child was delicate and had grown very rapidly. Had an earache first two months ago. Since Sunday last the right ear has been very painful. Ear pains him now very severely at times. The auricle stands out abnormally from the head. Canal contains some pus. Considerable tenderness over the mastoid. No fluctuation.

Treatment : Calcium sulphide and aconite in small doses.

April 4th.—The child was feverish during the night up to four o'clock, when he slept. No pain in the ear, however.

April 5th.—The pains, which recurred at times, were less severe and much less frequent. Appetite improved. Tenderness less over the mastoid. Same treatment continued.

April 6th.—Patient had more pain last night at times, which was very severe. Calcium sulphide given every hour.

April 7th.—Patient had but little pain after nine last evening. Has been much better all day. No pain. He continued steadily to improve until April 11th, when discharge ceased entirely, although it had never been profuse. Tenderness over the mastoid almost gone, and the redness and swelling which appeared a few days ago in front of the auricle have disappeared. The child was seen again April 16th, when almost all the inflammation had gone and the child was feeling perfectly well.

CASE 8.—Patient, æt. fifty-nine, Irish, came to infirmary Jan. 9th. He has been suffering since Christmas night with severe earache in left ear. The ear broke that same night, and the discharge, which has been profuse, has continued ever since. He complains of noises in the ear, and he has a dull pain over the mastoid. There is considerable deafness.

Examination showed : Left auditory canal filled with muco-pus ; *Mt* infiltrated, fleshy-looking, with a perforation in the lower portion. Calcium sulphide, gr. $\frac{1}{16}$, given, and canal cleared of muco-pus with absorbent cotton, and pulv. acid. boracic. et hydrastis insufflated. Discharge diminished under treatment until Jan. 25th, when the auricle became very much inflamed at the anti-tragus. The inflammation continued to spread until the auricle was entirely involved and twice its natural size on Jan. 26th. The ext. auditory canal was not involved in the inflammation. The discharge diminished in quantity. *Mt* very much congested. The erysipelatous inflammation extended over the mastoid, over parts in front of the auricle, and gradually over the whole scalp, forehead, and left eye ; also over the neck. The pain in the mastoid was not increased, but dull in character.

Jan. 27th.—Patient seized with a chill during the evening ; dizzy. Jan. 28th, temperature 104.5° ; pulse 124 in the evening ; discharge free from the ear ; *Mt* less congested. He was given appropriate treatment, including local applications for the erysipelas, but at the same time was ordered to take calcium sulphide, gr.

$\frac{1}{4}$ every three hours. The erysipelas subsided, and the pains in the ear and mastoid almost gone on Jan. 29th ; discharge less but thicker. *Mt* less congested, and perforation seen in lower posterior segment. The sulphide given less often, owing to diarrhoea, undoubtedly caused by this drug. The discharge ceased Feb. 2d, and the noises disappeared about the same time.

Feb. 12th.—Watch, left ear, $\frac{0}{48}$, but loud voice heard. *Mt* very little congested in lower segment ; perforation healed.

Feb. 19th.—Returned, saying he had taken a fresh cold, and he complained of an itching sensation last night in the same ear. *Mt* covered with muco-pus, and a perforation in lower quadrant. Watch, $\frac{c}{48}$ after Politzer inflation. Pulv. acid. boracic. et hydrast. insufflated every day, but the discharge remaining unchanged, I ordered him to resume calcium sulphide ; the discharge commenced immediately to diminish in quantity until Feb. 28th, when it ceased altogether. Politzer inflation used. The *Mt* continued to clear up, and on March 13th, the hearing distance was almost normal. He returned April 13th and said he felt entirely well. Hearing normal.

It is difficult to decide how much of the success in treatment to attribute to the calcium sulphide, as local means, Politzer inflation, etc., are employed as well, but in Case 4, nothing but the calcium sulphide was given—no local treatment whatever ; while in the last case, during the second attack of otitis media purulenta, the discharge did not grow less under local treatment till the calcium sulphide was given. In Case 7 nothing was given but the calcium sulphide and aconite.

CHOLESTEATOMA OF THE MASTOID PROCESS
WITH RUPTURE INTO THE EXTERNAL AUDI-
TORY MEATUS AFTER USE OF THE IRISH-
ROMAN BATHS.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by PORTER FARLEY, M.D., of Rochester, N. Y.

IN volume viii of this journal I have described four cases of severe disease of the mastoid process, among which there was one case of acute caries of the posterior wall of the external meatus, complicated with cholesteatoma of the mastoid process. Recovery followed, but there was a large defect in the bony parts involved. I am now able to report a similar case in which recovery was perfect.

In the first week of May, 1881, I was summoned to Carlsruhe by Dr. Schuberg to visit one of his patients, who for a long time had been confined to his bed by an exceedingly painful affection of the left external auditory meatus.

At my first visit, May 12th, I learned the following history :

The patient, a merchant thirty-three years old, of strong constitution, had been successfully treated twelve years previously by his physician, Dr. Schuberg, for a suppuration of the left mastoid process. The abscess had then been opened by a proper incision, and the wound healed so well that at present a scar is scarcely perceptible. There was no subsequent discharge, and until his present affection the patient is said to have heard well with that ear. In other respects his general health until recently was good.

Three months ago rheumatic pains appeared in the extremities, and for their relief an Irish-Roman bath had been ordered. On

the day following the bath, the patient was attacked with severe pain in his ear, and with shooting pains through that side of his head. A purulent discharge from the ear was accompanied by a remission of the pains. The rheumatic pains, however, continued. A second Irish-Roman bath was ordered. The pains in the ear reappeared, and continued during the last weeks. At times they were terrible. A swelling of the sub-auricular glands had appeared.

At present the patient appears quite sick, and complains of pain deep in his ear. The ear, however, is not sensitive to pressure, either upon the external passage or on the mastoid process, which last, with the exception of the above-named scar, is in every respect normal. Upon examination, several polypi are seen upon the inner third of the external passage; nevertheless, by Valsalva's experiment, one can hear a distinct sharp hissing of the air, followed immediately by a somewhat freer discharge of pus mixed with cholesteatomatous masses. The tuning-fork placed on the skull is heard on the diseased side.

The treatment ordered was boracic acid and the air douche. From the 12th to the 15th of May, several large cholesteatomatous masses were discharged, some spontaneously, and some by syringing. Meanwhile the patient remained free from pain.

On May 15th, with Wilde's snare, I removed two polypi from the lower and posterior wall of the external auditory meatus. During the operation, and subsequently, great quantities of cholesteatomatous matter were discharged. There was a kidney-shaped perforation of the drum membrane. The labyrinth wall was gray-red. There was great and permanent improvement in the subjective symptoms. On May 21st, the patient visited me at Heidelberg. There was still a discharge of the same matter. On June 21st he visited me a second time at the Heidelberg clinic. At this time, by good illumination I succeeded in probing a carious opening in the posterior wall of the inner third of the external auditory meatus. It was about the size of a pea, and the probe entered in a slanting direction nearly a centimetre. The treatment with boracic acid was continued. The patient visited me eight times up to the 4th of July. On the 27th of June I assured myself that the caries was healing, and that the repair of the drum membrane was begun. On the 4th of July recovery was complete, and the patient had a very satisfactory degree of hearing. Up to the present time he remains sound.

Genetically, this case may be regarded as follows:

The suppuration of the mastoid cells, which occurred twelve years before, healed just as did my case above referred to, and there intervened between the recovery from the first attack and the onset of the second, a period of perfect health. In this case the symptoms of renewed inflammation may perhaps be attributed to the use of the Irish-Roman baths. But there can be no doubt that the accumulation of concentric epidermis masses in the antrum mastoideum, with their slow growth through a long course of years, was a contributory cause. In view of the pathological anatomy of the case there can be no question that there was atrophy of the bony parts, due to the pressure of these constantly increasing epidermal masses.¹ An acute caries of the anterior wall of the mastoid cells appeared as a reactive symptom, caused by sudden swelling induced by repeated use of the Irish-Roman bath. The severe pain was due partly to this process and partly to the resistance offered by the posterior portion of the mastoid cells, in which sclerosis had probably taken place during the disease twelve years before; so that, though this part presented no objective symptoms, its condition certainly had much to do with the excruciating nature of the pain.

It is possible that the first attack of pain occurring after the first bath, with three days' remission after the appearance of a discharge from the ear, was caused by a simple acute attack of inflammation of the middle ear, and that the second period of pain was due to the perforation of the posterior wall of the external meatus. But judgment upon this point must be reserved, as the condition of the drum membrane during the latency of the disease was not known.

¹The enormous size to which the masses sometimes attain has been proved by examinations which I have made on the cadaver. Before me Bezold observed a case in the living subject and published it. See *Arch. für Augen- und Ohrenheilk.*, Bd. iii, p. 99, and Bd. v, p. 98.

NECROTIC EXFOLIATION OF THE SUPERIOR (?)
BONY SEMICIRCULAR CANAL, PRECEDED BY A
WEEK OF DIZZINESS AND VOMITING. RECOVERY
WITH LOSS OF SUCH DEGREE OF HEARING AS
HAD PREVIOUSLY EXISTED.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by PORTER FARLEY, M.D., Rochester, N. Y.

ON May 14, 1881, I received from Dr. Thornwaldt, of Danzig, the following clinical history, which was brought to me by the patient himself:

"A student, Mr. R., has been repeatedly treated by me for disease of the ear. When I first examined him about two years ago, I found the following condition: There was a copious fetid suppuration from the left ear. There was absence of the anterior half of the drum membrane, and the remaining half consisted, for the greater part, of scar tissue. The handle of the hammer was fixed to the opposite wall of the tympanum. Denuded bone could be felt by the probe in that part of the tympanum upward and forward from the promontory. The air douche by means of the catheter indicated a much contracted Eustachian tube, while upon the right side the air very easily entered the tympanum. Hearing on left side markedly diminished. The tuning-fork held on the skull was heard on the left side. The suppuration ceased after treatment of the middle ear by disinfectants and astringents, but only to return from time to time.

"About four weeks ago, after an absence of a year, R. came to me again for treatment. He was then very sick with chills, high temperature, and severe attacks of dizziness. There was a foul suppuration from the left ear, and severe pains shooting

through the entire left half of the head. After syringing with a solution of boracic acid, and catheterization, there was a speedy improvement of the general condition; the swelling of the external passage diminished, and there then appeared quite a large, hard granulation growing from that place where I had previously found denuded bone. As this granulation appeared to have a broad base, I have tried to destroy it by caustics and the galvano-cautery, but up to this time without any satisfactory result. Soon after beginning my last course of treatment, during the act of syringing, a small rough piece of bone was washed out."

At my examination, May 14th, I learned that the disease had existed since the seventh year, and had followed scarlet fever. The patient was very pale and dejected, but was free from fever, pain, vertigo, and subjective noises. A low-ticking watch, held upon the forehead, was heard upon the diseased side, and the tuning-fork held in like manner was heard only on that side. Hearing distance for speech was only about two metres. The left external auditory meatus was so filled with polypi that it was impossible to determine the condition of the deeper parts of the ear.

The treatment with solution of boracic acid was at first continued. In addition to this, up to May 21st, three applications of the galvano-cautery were made to the polypi without any reaction and without any disturbing symptoms during the intervals between the operations. On the 21st the patient sent for me, as he could not go out on account of severe vertigo and vomiting. On that day and the following one I found the condition in the ear to be the same as before. I visited the patient once or twice a day until the 29th, and every day found a normal condition of the pulse, temperature, and pupils. With the exception of vertigo and vomiting there was no abnormal symptom, such as constipation. There were great apathy and nearly total loss of volition, in a patient naturally ambitious and industrious. I directed abstemious diet and confinement to the bed. At first I endeavored by Charcot's quinine treatment to overcome the symptoms, but without success; so that I then limited the amount administered to the degree of simple saturation. As to the dizziness, the patient, upon repeated questioning, stated that when he looked at an object it appeared to move in an upward direction. On the 29th of May occurred the last attack of dizziness and vomiting. On the 31st the patient appeared again at my clinic. When I examined him with

reference to the advisability of a repetition of the use of the galvano-cautery, I discovered embedded in the granulations a black body which felt rough when touched with the probe, and which I easily removed with the forceps. The fragment was buckle-shaped, nine *mm.* long and about one *mm.* broad. The slight amount of soft tissue upon it proved upon microscopic examination to consist only of pus corpuscles and margarine crystals. This bony fragment was for the most part carious, but in certain parts of its concave surface a distinct groove was visible. Hearing was entirely lost on the left side, and has so remained to this day. But there has been no return of the vertigo or vomiting, and, in consequence of the continued treatment with the galvano-cautery, recovery proceeded so rapidly that as regards caries, necrosis, and the formation of polypi the patient could be regarded to be well at the beginning of August. It is now possible to form a better judgment of the condition of the deeper parts. The greater part of the drum membrane is absent. Its anterior and lower margins still remain, and from the latter a triangular tag of cicatricial tissue projects toward the promontory, with which its extremity is united. The malleus and incus are absent, and I have never been able to satisfy myself of the presence of the stapes, although I still have the patient under observation. The recovery from the disease has been accompanied by a highly gratifying improvement in the mental condition of this naturally talented young man. He at least so expresses himself, and so does his mathematical teacher.

This history, aside from its practical value, is of great physiological interest.

After the disappearance of the vertigo, which was experienced in an early stage of the disease, it reappeared violently, accompanied by vomiting, upon an irritation of the labyrinth. These symptoms disappeared upon the discharge of one of the necrosed semicircular canals, and the patient simultaneously lost such remnant of hearing as had till then been retained. The case also shows that irritation of the nerve terminations in the crests of the ampullæ may cause the same symptoms as an irritation of the cerebellum, the centre of muscular co-ordination, and that upon the paralysis or destruction of the nerves of the ampullæ the vertigo disappears.

Such clinical experiences are more valuable than physiological experiments. In such experiments there is great danger of accidental injury to the brain; but no such complication existed in this case; for pulse, temperature, and all the functions of the brain remained normal. The observations of these experiments, made by Nature herself, are valuable because of their cleanness. The more such observations multiply, the better furnished are we for the support of our views concerning the function of the semicircular canals and their adnexa, and that, too, with material far more reliable than is furnished by artificially instituted experiments.

Moreover, the latest results of experimental physiology are confirmative of the view that the nerves of the vestibule stand in close connexion with the function of muscular co-ordination, notwithstanding the contrary results reached by Baginsky, which we have elsewhere referred to, and have disputed on pathological grounds. Högyes,¹ upon the strength of his experiments, speaks as being certain that the vestibular terminations of the acoustic nerve constitute a special apparatus which, according to the position of the head and body, co-ordinate the movements of the eyes, and probably also control all those muscles which are concerned in maintaining bodily equilibrium.

¹ The true causes of the vertigo which accompanies increase of pressure in the tympanum. Prof. And. Högyes, of Klausenburg. *Arch. für die ges. Physiologie*, Bd. xxvi, p. 558.

PYÆMIC ATTACKS DURING AND AFTER RE-
COVERY FROM AN ACUTE PURULENT
INFLAMMATION OF THE TYMPANUM.

BY PROF. MOOS, OF HEIDELBERG.

Translated by PORTER FARLEY, M.D., Rochester, N. Y.

THE following case is the only one in my practice in which pyæmic attacks have occurred during the acute stages of an inflammation of the middle ear, and in this they even continued, although for only a short time, after the closing of the perforation. I publish the case, although I have to offer only opinions as to the connection existing between the symptoms. Perhaps others who have made similar observations may confirm my suppositions :

F. von T., student, came under my treatment May 5, 1881. For many years he has had nasal catarrh and a sensation of obstruction in the right nostril. His present disease of the ear began three weeks ago, following a renewed attack of his catarrh, and beginning with pain in the right ear. For three days he had been deaf in that ear. Since the last night he had experienced violent pulsation in it. The right external meatus was moistened with a little pus. The right drum membrane was flat, thick, and of a grayish red. The handle of the malleus was not visible. The mucous membrane of the right inferior nasal meatus was hypertrophied. The tuning-fork was heard by bone-conduction only on the right side. The watch was heard only on contact. Words could be distinguished at two metres. Under treatment by the nasal and air douches and a four-per-cent. solution of boracic acid,

improvement began in a few days. On the 11th of May the patient went out to walk, and was so imprudent as to sit down in the open air, notwithstanding the prevalence of a strong northeast wind. In hardly more than five minutes he experienced a chill and renewed severe pain in the right ear.

Nevertheless, on the morning of the 12th, I found only a considerable congestion of the vessels near the handle of the malleus. There were no visible signs of exudation in the tympanum, but hearing was almost wholly lost. In spite of the negative result of this examination with reference to exudation in the middle ear, there was by evening of the same day a profuse discharge of pus and a perforation in the anterior inferior quadrant of the drum membrane.

Treatment: Rest in bed; frugal diet; boracic acid.

Until May 16th, there was a profuse, painless discharge. On the 19th, the perforation had closed; there was no discharge and the patient felt well.

May 20th, 5.30 P.M.—Chill; temperature, 40.3° ; pulse, 112. Loss of appetite; constipation; restless night; frontal headache.

May 21st, morning.—After severe pulsation in the right ear during the night, there was a renewed discharge through a new perforation in the inferior posterior quadrant. Temperature, 37° ; evening 39° .

May 22d, morning.—Temperature, 37° . Local condition and treatment the same as before. At noon a chill. At 1 P.M., temperature 39.1° ; at 4 P.M., temperature 40.4° ; at 6 P.M., 40.6° . Shortly after followed a chill. At 9 P.M., temperature 38.4° . At midnight, temperature 38.8° . Frontal headache.

From this time I was in daily consultation with Prof. Friedreich. Ordered quinine, 0.3 every three hours.

May 23d, 6 A.M.—Temperature, 36.5° . Quinine was used from this time until May 29th. Rochelle salts to correct constipation. Local treatment as before.

May 26th.—Discharge from ear ceased.

May 27th.—Closure of perforation. At 9.30 A.M., a chill; sweating till 2 P.M. At 4 P.M., another chill. At 6 P.M., sweat. At 8 P.M., another chill. Continual headache.

May 28th and 29th.—The fever has subsided. Sweating continues. General condition comfortable. Hearing nearly normal. There is recovery from the local disease, without any perceptible changes in the drum membrane.

Prof. Friedreich examined the internal organs twice daily during the entire prevalence of the fever, but was unable to detect any abnormal condition other than a slight enlargement of the spleen. The urine contained no albumen.

When attacks of pyæmia occur in the course of a chronic suppuration of the ear, we can judge more correctly of the history of the disease than when they occur in acute cases.

In the first place, we are justified in assuming a diseased condition of the petrous bone, especially a gradually progressive caries which favors the propagation of the disease to one of the sinuses of the brain. It is quite otherwise when, as in this case, these attacks occur during the acute stage of inflammation in a previously healthy ear. If the case is not one of acute caries, associated with purulent inflammation of the tympanum, such as we had no reason to believe this to be; or if the presence and malign influence of micro-organisms in the inflamed parts can be excluded—though such a condition of affairs is possible in a simple non-purulent inflammation (Zaufal)—the following theories of the condition must be considered :

1. Intermittent fever. This diagnosis could not be accepted, in spite of the ascertained enlargement of the spleen. The type of the fever negatived it, and so too, especially, did the fact that the chills came on during the use of the quinine. It is well known that the occurrence of new chills and increase of temperature contra-indicate the presence of intermittent fever.

2. Phlebitis and thrombosis of one of the veins or sinuses near the tympanum. This would scarcely be possible during the course of an acute affection of the middle ear, without the presence of certain abnormalities in the structure of the organ which would favor a rapid extension of the inflammation to the neighboring veins. As such may be mentioned :

- (a) Defect in the bony structure of the floor of the tympanum, which was observed by Toynbee fifty-four times; also immediate contact of the inflamed mucous membrane with the sinus of the jugular vein, and consequent phlebitis and thrombosis of that vessel.

(b) Defect in the roof of the tympanum, which would favor the extension of the inflammation to the superior petrosal sinus. Toynbee observed such defects twenty-five times, and they have been observed at different times by Hyrtl, Troeltsch, Retzius, Bürkner,¹ Jaenicke,² and Flesch.³ In case of possible participation of the mastoid cells in the purulent inflammation there are other conditions to be considered :

(c) A canal lined with dura mater, extending from the mastoid cells beneath the superior semicircular canal to the posterior surface of the pyramid, and which opens above into the sulcus petrosus, between the porus acusticus int. and the entrance to the aqueductus vestibuli (Retzius, Voltolini).

(d) A venous canal which begins in the mastoid cells and ends in the sigmoid sinus at the junction of its descending and horizontal parts. (My own observation. See *Virchow's Arch.*, vol. xxxvi, p. 15.)

(e) Finally, we must remember the possible existence of numerous small veins which may extend from the mastoid cells toward, and discharge into, the lateral sinus.

Opposed to the theory of phlebitis and thrombosis of a large vein or sinus, there were in this case no observable metastatic centres of inflammation, such as are generally caused by the breaking down of a large thrombus. As to the repeated failure of Prof. Friedreich to discover any trace of embolism in the lungs, it may be objected that there perhaps existed small infarctions in the lungs, so centrally situated and so covered with normal lung tissue as to make their recognition by physical examination impossible ; but in such a case, there would certainly have been some other symptom present, such, for instance, as dyspnœa.

Upon the theory of a phlebitis and thrombosis of a small sinus, for instance the superior petrosal, the non-discovery

¹ Contribution to normal and pathological anatomy of the ear. *Arch. f. O.*, Bd. xiii, p. 163.

² Anomalies of the base of the skull, and thinning and perforation of the lining membrane of the tympanum. Inaug. Diss., Kiel, 1877, pp. 5-14.

³ The recognition of so-called dehiscence of the lining membrane of the tympanum. *Arch. f. O.*, Bd. xiv, p. 15.

of embolisms in the parenchymatous organs is more easily understood. The course of the fever, too, and the variations of temperature contra-indicate an inflammation of a large sinus, such, for instance, as the lateral sinus. When this condition exists, without any other complications in the cranial cavity, the fluctuations in temperature between the chills, especially if they are long separated, are much greater; or if the chills occur with short intervals, the temperature remains continuously very high. For instance, in a case of Schwartz's, with no other brain complications, and in which an autopsy was made, the temperature fell 3.9° C.¹ In a case which was observed in Friedreich's clinic and was published by me, the fall was 4.8° .²

Wreden considers these great fluctuations of temperature a very important symptom for the diagnosis of phlebitis and thrombosis of a large brain sinus; and he was the first to call attention to the importance of the course of the temperature in the recognition of this condition.³

It appears probable to Friedreich and me that in our case the pyæmic symptoms were due to an inflammation of a small brain sinus, probably the sinus petrosus superior. Whether this disease always runs a favorable course remains doubtful.

¹ *Arch. f. O.*, Bd. xii, p. 129.

² Contributions to the Pathology of the Ear. Second paper. *These ARCH.*, vii, p. 465.

³ *These ARCH.*, iii, 2, p. 173.

CEDEMA IN THE TEMPORAL AND ZYGOMATIC REGIONS, AS A SYMPTOM OF PHLEBITIS AND THROMBOSIS OF THE LATERAL SINUS.

BY PROF. MOOS, OF HEIDELBERG.

Translated by PORTER FARLEY, M.D., Rochester, N. Y.

IN volume vii, p. 469, etc., of *Arch. Opthal. and Otology*, I have published four cases of phlebitis and thrombosis, of the sinus lateralis, among which the fourth, on account of its clinical history, is particularly noticeable.

Besides continuous diffuse headache and a temperature ranging between 38.6° and 40° (without chills), and was no other symptom present except a swelling, which was described by the patient himself as sausage-shaped, and extended from the temple to the front of the ear on the diseased side, and which he had noticed at his own home. I noted down the appearance in the following words: "In the temporal region above the concha is a diffuse, œdematous, painless, colorless swelling, which extends forward and downward, and is lost in the region of the tragus." At the autopsy, circumscribed meningitis and a phlebitis and thrombosis of the sinus lateralis were found. During the epicrisis I made the remark that I regarded the symptom of œdema as very important; but as being pathognomonic only when an accompanying caries of the squamous portion of the temporal bone can be excluded. It is as characteristic of a phlebitis and thrombosis of the sinus lateralis as is œdema of the mastoid region (Griesinger), or as is œdema of the eye-

lids and eyeball, of thrombosis of the sinus cavernosus (Huebner).

Since I published this case I have seen another in which I likewise observed œdema in the temporal region. Although I observed it for scarcely a day, and although the intracranial disease was probably complicated, and although I did not finally obtain the results of an autopsy, I cannot refrain from again speaking more particularly on this subject. Reflection has satisfied me that this symptom is of rare occurrence, and for the reason, as we shall later see, that the anatomical conditions upon which it depends are peculiarities of development of an exceptional nature. For this reason I would again call the attention of the profession to this subject. Perhaps others have made similar observations, and by their publications may throw further light upon the matter. It is only by increase in their number that diagnoses based upon probabilities can gain in certainty.

This second case is as follows :

S. P., a maiden lady, thirty-one years of age, was subject during former years to a discharge from the right ear, but without any considerable discomfort until twelve days ago, when she was attacked by a steadily increasing pain, deep-seated in the right ear, and shooting through that half of the head. At the same time, there appeared upon the surface of the right mastoid process a large and gradually increasing tumor ; likewise "a hard œdema of the right temple and the adjoining region of the zygomatic process." (Statement of the physician in charge, Dr. W. of K., Rheinpfalz.) The skin was hot. The temperature had up to this time not been taken. There were great thirst, no appetite, and no chill. The physician in charge had, six days before, made an incision over the mastoid process, and he stated that much pus had been discharged, but there had been no decided collapse of the tumor. The severe pain, however, subsided. Since day before yesterday, there had been loss of consciousness, no vomiting, no change in the pupils, pulse ranging between forty and fifty-six.

Treatment had been by use of ice and cathartics.

I saw the patient for the first time at six o'clock on the evening of January 3d. She was absolutely unconscious. The pu-

pils reacted sluggishly, but alike on both sides. The pulse was occasionally intermittent, fully fifty-six in a minute. There was diffuse œdema of the temple and the zygomatic region, with slight reddening of the skin. In the right incisura intertragica is a dirty foul-smelling secretion. The right external meatus is closed by a large polypus, which is attached to the posterior wall. Upon the middle of the greatly swollen mastoid process is a wound about an inch and a half in length. The skin already has a gangrenous bluish-red appearance.

Although under these circumstances the case seemed hopeless, I nevertheless proposed to the attending physician and the relatives, as a last resort, the free opening of the abscess, which was readily acceded to. I made the operation with the cartilage-knife in the direction of the former wound, and by a long incision penetrated a deep carious opening in the mastoid process. A great quantity of ichorous matter was discharged. The periosteum was everywhere loosened from the bone. I easily and repeatedly passed the nozzle of a rubber syringe into this carious opening, and drove the water from it through the external auditory meatus. After the bleeding stopped the pulse rose to 88, and the patient raised her hand repeatedly to the diseased ear. Half an hour after the operation the pulse was 60. During the following night the condition remained unchanged. At nine o'clock the next morning there was no discharge from the wound; the pulse was 48, the temperature 40.6°. The right pupil was much the larger. Stupor continued to increase, and two hours later death occurred.

I could not obtain an autopsy.

These symptoms, proceeding from the great nerve centre, suggest the following conditions to be considered in making a diagnosis:

1, Abscess of the brain; 2, œdema of the brain; 3, meningitis; 4, phlebitis and thrombosis of the sinus lateralis.

Abscess of the brain. As two days before there were no brain-symptoms, its acute stage being short must have been marked by very violent symptoms, such as convulsions or the appearance of sudden paralysis; but such was not the case. The high temperature, over 40°, although taken only once, argues against this diagnosis.

Œdema of the brain was excluded by the persistent cephalic pulse and by the decided dilatation of the pupil on the affected side during the last hours of life. In view of these symptoms, and notwithstanding the absence of vomiting, I inclined to the diagnosis of meningitis, complicated, as these cases due to otitis so frequently are, by a phlebitis and thrombosis of the sinus lateralis. The absence of chills is explained by the probable fact that the thrombus had not yet broken down.

There was no reason to suspect a caries of the squamous portion of the temporal bone, a condition which I have frequently observed, but as yet only in children under two years of age.

Anatomical Connection between Œdema of the Temporal Region and Phlebitis and Thrombosis of the Lateral Sinus.

When œdema of the temporal region appears coincidently with a thrombosis of the lateral sinus, and when it can be shown that it does not depend upon caries of the temporal bone, the question remains whether it is possible to associate the two conditions upon anatomical grounds. This can be done by a consideration of the parts concerned in reference to their manner of development. In the petro-squamous fissure runs the petro-squamous sulcus, which, according to Luschka,¹ is to be regarded as the original sinus transversus. Kirchner² gives a picture of this. Its external opening is sometimes found still in the horizontal part of the squamous portion, behind the posterior articular process; it is the foramen jugulare spurium, which, however, is frequently found near the posterior root of the zygomatic process (Luschka, *l. c.*). This sinus either opens into the sinus lateralis, or it perforates the squamous portion and anastomoses with the deeper temporal vein. According to Kölliker,³ it originates during the foetal development of the jugular veins. He writes as follows:

¹ Die Anatomie des menschlichen Körpers, Bd. iii, 2, Tübingen, 1867.

² Beitrag zur Anatomie der äusseren Ohrtheile. Habilitationsschrift, Würzburg, 1881.

³ Kölliker: Entwicklungsgeschichte des Menschen und der höheren Thiere, Leipzig, 1879, p. 928.

"The first branchlets of the jugular veins are within the cranial cavity and flow together on each side into one vessel, which may be regarded as the beginning of the actual jugular, and which later appears as the sinus transversus. This vessel, however, does not leave the cranial cavity through the foramen jugulare, but through a special opening anterior to the ear, which, as Luschka has shown, may even be present in the fully developed skull, and is there found in the temporal bone above the glenoid cavity. Later this opening closes, and the blood of the cranial cavity is discharged through an internal jugular, an offshoot from the lower end of the primitive jugular, near the ductus Cuvieri, so that then the original vein appears as an external jugular."

Zuckerkandl's¹ investigations show that the relations above described are not so very rare even in adults. In 280 skulls he found the sinus petro-squamosus twenty-two times, and the foramen jugulare spurium three times. Moreover, Kieselbach,² in the case of a child one and a half years of age, could not demonstrate any connection between this sulcus petro-squamosus and the sulcus sigmoideus.

The appearance of the symptom in question assumes the existence of a petro-squamous sinus, and its communication on the one side with the sinus transversus, and on the other with the deep temporal vein after passing through the temporal bone. According to the anatomical investigations above described, these conditions but seldom exist, and therefore œdema of the temporal region, as a symptom of thrombosis of the lateral sinus, will be of rare occurrence. Though this is an indirect sign, its diagnostic value is as great as is that œdema over the mastoid process which appears after the extension of the thrombosis in the emissarium which runs outward through the fossa sigmoidea. That this symptom, first pointed out by Griesinger,³ may be actually pathognomonic is proved by an autopsy made

¹ Beitrag zur Anatomie des Schläfenbeines, *M. f. O.*, 1873, No. 9.

² Beitrag zur normalen und pathologischen Anatomie des Schläfenbeines mit besonderer Rücksicht auf das kindliche Schläfenbein, *A. f. O.*, Bd. xv, p. 253.

³ *Arch. f. Heilk.*, Bd. iii, page 437, ff.

by him and by another made by me. Griesinger¹ truly says:

"Against the explanation of that swelling by thrombosis of the emissary vein, it cannot be objected that the emissary vein conducts the blood from the sinus outward, and that externally none of its branchlets are affected by its obstruction. The emissarium communicates between the sinus and the post-auricular veins, and the direction of the flow of blood in it is determined by the direction of greatest pressure."

This entire quotation may be adopted as an answer to a somewhat similar objection in reference to œdema of the temple. I had still before me the task of further examining the specimen of the first-described case, to discover, if possible, whether it possessed any such abnormality of development. In reference to the sinus this was not possible, because the diseased and altered lateral sinus, as well as the greater part of the dura of the affected temporal bone, had been already cut away.

In reference to the sulcus, etc., I can now make the following supplemental communication:

There is in this specimen a so-called sulcus petrosquamosus two *mm.* in length. By the side of this, and perforating the squamous portion of the temporal bone, is an emissarium whose external opening is two or three *mm.* above the root of the zygoma. There is no foramen jugulare spurium. There is, however, near the posterior root of the zygoma, and above the spina supra meatum, a depression, an egg-shaped cavity eight *mm.* long, five *mm.* high, and five *mm.* deep; but it has a blind ending.

In this respect the œdema of the temporal region in our first observation is only incompletely explained. It is possible that it depended upon the fact that the cicatrization upon the mastoid process obliterated a number of veins, and that therefore throughout the region of their anastomoses œdema was easier caused during the thrombosis of the sinus.

Further observations are necessary to determine this question.

¹ *L. c.*, pag. 447, und Gesamtabhandlung im Bd. i, Diagnostische Bemerkungen über Hirnkrankheiten, pag. 458.

ON THE PRODUCTION OF ARTIFICIAL DEAFNESS,
AND ITS BEARING ON THE ETIOLOGY AND EVO-
LUTION OF THE DISEASES OF THE EAR.*

BY DR. CASSELLS, GLASGOW.

EARLY in the year 1876, my study of the ear, both in a healthy and in a diseased state, led me to conclude that a certain degree of tympanic tension was necessary, not only for the health of its tissues, but for the maintenance of the sense of hearing, and that disturbances in this tympanic tension produced an immediate defect in the power of hearing articulate speech.

How I came to look at this subject, in this way, is easily told. In the first place, I saw that the apparatus of hearing, in a state of health, was a most perfect barometer; that the ear, more readily than any other organ in the body, made us aware directly of the existence of the atmosphere, and that the effects produced by its weight on the ear were often attributed to other causes.

I shall now quote from my original MS. the exact words in which, in the year 1876, I formulated my theory of the etiology and evolution of ear-diseases: the propositions are as follow:

1st. That a certain degree of tympanic tension is essential to perfect function, *i. e.*, perfect hearing.

2d. That the essential cause of all the affections of the

* Read in the subsection of Otology of the British Medical Association meeting in Cork, in August, 1879. A brief abstract appeared in the *British Medical Journal*, vol. ii, 1879, p. 328.

organ of hearing, is a disturbance of the normal tympanic tension.

3d. That all the pathological phenomena of the diseases of the ear evolve themselves with regular sequency.

I now wish to explain one or two points, in regard to these conclusions, before I go farther.

The first of these is, in regard to the amount of the normal tympanic tension.

For all purposes I think that we may regard its measure as the difference between the air-pressure, at any level upon the outside of the membrana tympani of a healthy ear, *plus* the traction force of the accommodating apparatus of the organ, on the one hand, and, on the other, the opposing air-pressure within the tympanum, *plus* the resistance of the tissues; but the exact difference between the weight of the air-pressure on the inside and that on the outside of the tympanum, could be ascertained with the greatest exactness, experimentally, by those who are better circumstanced than I am, in respect to carrying out such experiments.

In saying that the pathological changes "evolve" themselves from this common cause—disturbed tympanic tension,—I do not mean that "the compound parts of an aggregate have passed from a more to a less diffuse state," which is the meaning generally attached to the term "evolution." What I do mean is, that there is to be seen in the diseases of the ear, an expanding or unfolding or an opening out of these pathologic processes, from a simple to a complex condition.

As all the facts upon which my conclusions are based are familiar to most of us here, I shall only speak of them in a general way.

On examining the healthy ear, what strikes one is the amount of elastic tissue and muscle which enters into the construction of the apparatus of hearing, and that there is also a perfect accommodation-apparatus, by which the ear adjusts itself to changes in the atmospheric pressure, and that there is every provision made in the apparatus of hearing, to avert the consequences that might follow the too sudden rarefaction or condensation of the air, either inside or outside of the tympanum.

That the immunity from all annoyances or injury which the healthy ear enjoys, in these circumstances, is due to the power that it possesses of adjusting itself to the respective air-pressures, cannot, I think, be questioned.

The second formula that I have stated is founded on a sound and sufficiently large clinical experience, and I deem it to be a just inference from the first proposition, although I can see that there exists a gap between them. To fill up this gap gave me some thought, for I saw that it was necessary to prove, that a disturbance in the tympanic tension *could* cause tissue-change in the structures of a healthy ear.

To accomplish this, the following experiments for the production of artificial deafness, were undertaken.

The experiments were performed on the 5th of November, 1876, on a man aged forty-three years, in a room, the temperature of which was 64° F.; air quiet and no apparent currents; clear, dry weather.

Here is the state of the man's ears before being experimented on: His hearing distance, on both sides, to articulate speech, was perfectly normal; a watch, the normal hearing distance of which was six feet, was heard by him on the right, six feet clearly and distinctly, and faintly on the left at four feet.

The right membrana tympani was normal in concavity; cone of light interrupted in the centre, otherwise membrana tympani quite normal in all respects. He is a nasal breather by habit. The left Eustachian tube is slightly catarrhal.

Two methods were now used to disturb the balance of the tympanic tension. One, the *Valsalvian method*, of inflating the tympanum, was employed to increase the density of the air contained in the tympanic cavity. The other, known as *Maissiat's experiment*, was used for the purpose of rarefying the air in that cavity.

I have now to ask your attention to the results of these experiments, only with reference to my second formula.

The *Valsalvian experiment* gave no positive results to this particular investigation. On observing the membrana tympani during the experiment, only the usual and well-known ap-

pearances were to be seen, but no change of tissue whatever; there was, however, a sensation of stuffiness in the ears, with a slight whizzing, subjective tinnitus; there was no appreciable influence produced on the acuteness of the hearing, judged by the watch and voice, while the experiment lasted.

Maissiat's experiment: This experiment was introduced by Maissiat in 1838, who proved by it, that the air in the tympanic cavity is rarefied. Toynbee, who seems to have adopted this experiment, declared that it *condensed* the air in the tympanic cavity, a statement which has been shown to be incorrect by Politzer, who, using more exact experiments, confirms the opinion of its discoverer.

In order to produce an artificial deafness in the same way as a natural deafness is caused, Maissiat's method of rarefying the air contained in the tympanic cavity was employed in the following manner.

First stage of experiment.—A manometer (similar to the one figured on page 153 of Politzer's "Lehrbuch der Ohrenheilkunde") was hermetically fixed in the outer orifice of the external meatus of the right ear. The act of swallowing was now performed in a deliberate manner several times in succession, water being used to facilitate this process, during the performance of which the nostrils were *open*. While this stage of the experiment was being carried out, no movement took place in the mercurial column of the manometer.

Second stage.—The act of swallowing was now repeated, in the same manner as in the first stage, while the nostrils were held firmly *closed*, and the following phenomena were observed and noted:

At the first act of deglutition, the column of mercury in the instrument descended considerably. On this act being repeated a second time, it still farther descended; during the third repetition of it, the mercury was drawn altogether into the meatus.

Third stage.—The experiment was now repeated without the manometer, but in every other respect the same as in the last stage.

While the act of swallowing was being carried out, its effect on the membrana tympani was observed: the first act of swallowing caused this membrane to vibrate backward and forward several times and then to recede a little, becoming at last visibly more concave. With this, there was aroused, at once, a sensation of dulness in the general hearing. On a repetition of this act, the membrane became still more concave, and now signs of congestion began to appear on its surface, along the anterior aspect of the handle of the malleus. At this stage there were now experienced a general and deeper muffling of all sounds and a slight tinnitus. With the third act of swallowing (*the nostrils meanwhile having been kept rigorously closed throughout the experiment*), the following facts were observed: The membrane was rigidly fixed, the congestion of its tissues was increasing rapidly, and looked as if it would go on doing so, were the conditions of the experiment to continue.

There was, at this stage, a complete muffling of all natural sounds, such as the singing voice, articulate speech, the crackling of the fire in the grate, and the noise of the street traffic; all heard distinctly by the subject of the experiment, at the outset and before being experimented on, were now all perceived, as if the ear were stuffed with cotton-wool, but the tic-tac of the watch was heard ringing out clearly and distinctly and at an increased distance to that at which it was heard at the outset of this experiment. Instead of being heard at six feet, as it was then, it was now heard as a clear metallic clink at a distance of nine to ten feet. The subject of the experiment, who was breathing and speaking during its continuance, without in any way affecting or altering its condition, declared that he thought the reason why he heard the watch so well, was that he heard nothing else distinctly.

The perception of aerial tones of the diapason, ranging from $c^1 = 512$ to $c^2 = 1024$, held close to the ear, was almost completely extinguished; the perception of transmitted tones was slightly diminished.

Fourth stage.—On the patient releasing his nostrils and

swallowing a few times in succession, the membrane soon regained its normal position, and in an hour or so afterward the hyperæmia of its surface had diminished; the dulness of hearing lasted for some time afterward.

Fifth stage.—The orifice of one meatus was hermetically sealed up, and the other left open. Maissiat's proceeding was then performed to the same extent as in the third stage, already described. After performing the act of deglutition three times in succession, all the sensations and appearances that were called forth in the third stage of the experiment, were now experienced and seen on the membrane of the left and open ear, while in the right and closed ear, no such sensations were felt. On the instant, however, that the plug was removed from the meatus of the right and hitherto closed ear, similar sensations to those which had been felt in the left ear all along, now made themselves known at once in the right, showing that the air in the cavity of the tympanum had been exhausted, and that the membrana tympani had been pressed in by the superabundant outside air-pressure; this conclusion was tested in the following way:

A pneumatic speculum was now inserted into the orifice of the right meatus, that canal being hermetically closed by the instrument.

The last stage of the experiment was then repeated in all its details, and the membrana tympani inspected, while these were being carried out. Scarcely any motion was to be seen in the membrane of the closed ear, and none of the subjective symptoms were called forth in it so long as the canal remained closed. On the left ear all the former symptoms were as prominent as ever. Air was now admitted to the canal of the hitherto closed ear, and the behavior of the membrana tympani watched. It was seen to be drawn in suddenly with a bang toward the tympanum, and to remain in that position, its surface being very concave.

All the former sensations and appearances were now felt in the ear and seen in the membrana tympani; so great, indeed, was the congestion of the membrane, that I began to fear that a veritable ear-disease had been created in the sub-

ject of the experiment, who, I may add, was a man of education, and accustomed to weigh fine distinctions, and to compare and to differentiate the sensations of sound and feeling.

I have now finished the narration of these experiments. It would, however, be premature to draw any conclusions from them, owing to their limited range and duration, and, therefore, incompleteness. But I think this incompleteness may be for the present moment legitimately supplemented by a "scientific use of the imagination."

If, therefore, three of the more common symptoms of ear-disease can be produced artificially by an experiment in a few minutes, and in the order in which they appear naturally in disease, then, I ask, is it not a warrantable inference to say that a continuance of the same experiment for a few hours or days would lead to the further development of these symptoms, and to the production of more complex tissue-changes?

Be that as it may, I have to express the hope that you will not regard my theory in respect to the etiology and evolution of the diseases of the ear, as the production of a "luxuriant fancy and few facts," but that you will see that it is the outcome of a fairly wide experience, and that it is built upon a physiological and clinical foundation.

Nevertheless, if I only succeed in enlisting your interest in the subject of my paper itself, I will be content.

UNSUCCESSFUL ATTEMPT AT RESTORING AN EAR-CANAL, CLOSED BY CAUTERIZATION WITH SULPHURIC ACID.

By H. KNAPP.

The Sister of Charity, St. V., of the Asylum St. Vincent de Paul of this city, while suffering from neuralgic pain in the left ear on Nov. 21, 1881, thought to find relief in the topical application of ether, but by mistake poured concentrated sulphuric acid, directly from a little bottle, into the ear. Immediately afterward she had excessive pain, but was free from it the following day. Extensive ulceration and profuse discharge set in. Her physician kept the ear clean by syringing, and endeavored to keep the canal open by inserting pledgets of lint steeped in medicated vaseline, by laminaria probes, and other contrivances, but the gradual closure could not be prevented.

When she came to me in February, 1882, the meatus auditorius was completely obliterated, and the auricle reduced to about one third of its natural size by the contraction of cicatrices which occupied its whole anterior surface. She heard the tick of the watch on contact with the ear and the adjacent parts; V was $\frac{2}{3}$. She suffered from noises in the ear, and her own voice sounded stronger on that side of the head, a symptom which distressed her greatly. The other ear was healthy.

Thinking that the scar might, perhaps, not extend to the bottom of the ear-canal, and even if it did, the caustic might not have destroyed the drum membrane, or might at least have left the tympanic cavity intact, I held an attempt at the restoration of the canal justifiable. With a long, narrow-bladed (Graefe's cataract) knife I penetrated 2.5 *cm.* into the depth of the canal, and enlarged the wound on both sides until the blade of the knife

struck the bone in the inner portion of the canal. After the arrest of the moderate hemorrhage, I introduced a perforated silver tube, which was removed and re-introduced three times daily, the tube and the wound being, of course, carefully cleansed each time. The tube had a tendency to come out, and as, in a week, it could not be introduced so deep as at the beginning, I made the incision larger than before. The knife was advanced in the direction of the canal until its point was arrested by hard bone, the promontory. The depth of the wound was fully 3 *cm.*, and its calibre was enlarged by incising the tissue down to the bone on the anterior, inferior, and posterior sides of the canal. Though I had undoubtedly opened the tympanic cavity, nothing but a moderate quantity of blood escaped.

I inserted a longer and broader silver tube, which was changed two or three times a day. The patient experienced little pain, and noticed that both the tinnitus and the autophony had disappeared. Her hearing also was better and "more natural." This comfortable condition, however, was not of long duration. The thick canula, which completely filled the new canal, and was held in position by a pad of absorbent cotton, over which the nun's white head-dress passed, surrounding the scalp as a tight-fitting cap, had likewise a tendency to come out, and when pressed in too firmly by the cap, it would inflame the parts and cause pain. Gradually it had to be replaced by thinner and shorter ones. When the canal showed a decided tendency to narrow again, I inserted a laminaria bougie, which dilated the canal, but caused pain and inflammation, and had to be left off.

The patient considered even a partial restoration of the canal to be of material benefit, for she was free from the annoying reinforcement of her own voice so long as the canula was in. With the greatest persistency she had the new canal syringed out and the canula inserted two or three times daily, but in spite of every endeavor we lost ground, and as I knew of no mode to keep the canal permanently open, I advised her at the end of four months to give up further treatment. The canal closed again; the tinnitus and autophony returned as before.

From the complete failure of the operation I concluded that the concentrated sulphuric acid which was poured in had reached and cauterized the whole extent of the ear-canal, including the drum-head. The subsequent cicatricial

occlusion must have been total. If this condition prevails, I am inclined to think that a restoration of the canal is next to impossible. I base this opinion on the fact that hitherto all our endeavors to accomplish so simple an object as to keep an artificial perforation of the membrana tympani permanently open have proved fallacious.

REPORT ON THE PROGRESS OF OTOLOGY IN THE SECOND HALF OF THE YEAR 1882.

I.—NORMAL AND PATHOLOGICAL ANATOMY AND HIS- TOLOGY OF THE EAR.

BY DR. H. STEINBRÜGGE, HEIDELBERG.

Translated by J. A. SPALDING, M.D., Portland, Maine.

1. J. G. WAGENHÄUSER. Contributions to the anatomy of the temporal bone in children. *Archiv f. Ohr.*, vol. xix, part 2, p. 95.

2. ARTHUR BÖTTCHER. Cotugno; the aquæductus vestibuli, and later authors on the membranous labyrinth. *Archiv f. Ohr.*, vol. xix, part 2, p. 148.

3. EUGENE FRÄNKEL. Further investigations concerning ozæna simplex. *Virchow's Archiv*, vol. xc, 1882.

1. WAGENHÄUSER's contributions to the anatomy of the temporal bone in children are divided into two parts, the first of which discusses the fossa subarcuata; the second, "the petrosquamous fissure and the extension of the dura mater as a lining membrane of the tympanum." After summing up the data concerning the fossa subarcuata which have been given by other authors, particularly by v. Tröltsch, the author describes the progressive alterations which take place in this region at different periods of intra-uterine life and in newborn children, and illustrates them with plates.

The cavity which lies beneath the superior semicircular canal undergoes a considerable enlargement during the sixth and seventh months, and expands into a canal which reaches the

external surface of the skull, where it exhibits an orifice 5 *mm.* wide. The fossa does not enlarge at a later date, but on the contrary, in newborn children it again appears somewhat smaller, while its canal-like continuation to the outer surface of the skull is closed over by cartilage. The cavity retains its form up to the third or fifth year of life. The author then studied the topographical relations of the fossa subarcuata in the foetus and young children from successive sections of the temporal bone made perpendicular to the longitudinal axis of the pyramid in a direction from inward outward. All of the sections of the dura mater which penetrated into the canal showed a larger vein and a smaller artery. Bands of connective tissue with numerous small vessels penetrate into the spongy wide-meshed bony substance almost as far as the semicircular canals, and further outward into the neighborhood of the antrum, without, however, taking any part in the lining membrane of this cavity. These conditions also are illustrated by sketches. Wagenhäuser here reminds us of the possibility lately suggested by Prof. Lucae, that morbid processes might be conducted from the interior of the skull to the labyrinths of children by means of these vascular bands of connective tissue, as well as of the importance of the vessels, which have just been described, in the nourishment and further development of the temporal bone of children.

The fact that the fossa subarcuata undergoes considerable enlargement in various animals, and even embraces a portion of the cerebellum, induced the author to extend his investigations amongst several mammals.

In the second portion of his work, the author mentions the sutures (mastoid-squamous, fiss. tympano-mastoid., petro-tympanica), which originate from the union of the individual portions of the temporal bone, and then describes in detail the fiss. petroso-squamosa, its origin by imposition of the tegmen tympani upon the squamous bone, and further, the process. inf. tegm. tympani which separates the fiss. petro-squamosa from the fiss. Glaseri, and the oblique fiss. tegm. tympani. The relations of the fibres of connective tissue which penetrate these fissures were studied in various sections, which are illustrated in a third plate by sketches from the temporal bone of a child of four years of age. The result shows that in newborn children, all along the entire course of the fiss. petro.-squamosa, a direct continuation can be discovered between the lining membrane of the cranial and

tympanic cavities, which in older children is interrupted by the development of the proc. inf. tegm. tymp. in the anterior portion of the tympanum, and these may extend from the middle of the tympanum to the cavities of the mastoid process. Hence, when the bony union of the fissure advances, the connection between the dura mater and interior lining membrane is limited to the posterior portion of the tympanum and the beginning of the antrum. In describing the extension of inflammatory processes from the tympanum, mention is made of a small vein which is visible in all of the sections just above the fissure. Inasmuch as the vein opens into the transverse sinus, it may lead to phlebitis and thrombosis. The propagation of morbid processes from the tympanum to the dura mater, as well as disturbances of nutrition in the bony tegm. tymp., which in such cases appears surrounded both above and below with diseased periosteum, are likewise emphasized.

In conclusion, the author reminds us of the extension of morbid processes in an inverse direction from the interior of the skull to the tympanum, and cites the case, published by Moos and the reviewer, on the formation of a neo-membrane in hemorrhagic pachymeningitis with these words: "The above-mentioned authors are inclined to oppose the propagation of a morbid condition from the dura mater to the tympanum by this process."

As this quotation might be misconceived by readers to whom the original of our work was unknown, as if this were simply a case of agreement concerning well-known points, we should like to define it more precisely by saying that our discovery of a neo-membrane in the middle ear is *unique*, and offers an entirely new argument in favor of a systematic connection between the cerebral membranes and the lining membrane of the tympanic cavity. In the darkness which still envelops the incipient stages of hemorrhagic pachymeningitis, we have no right to explain the participation of the tympanic mucous membrane in this morbid process as simply due to the *propagation* of an inflammation, just as happens in most suppurative inflammations of the tympanum due to infection. The formation of the neo-membrane was, therefore, purposely designated as one of the "*partial symptoms*" of the pachymeningitis, and it was also urged that the regional distribution of the middle meningeal artery, which sends the petrous branch to the tympanum through the Fallopian canal, must be considered in any explanation of the morbid process.¹

¹ These ARCHIVES, vol. xi, p. 97.

The reviewer finally expresses the opinion that morbid processes are much less frequently transmitted from the interior of the skull to the tympanum, "and at all events this will be of slighter importance in a practical point of view." We cannot unreservedly assent to the first point, since the examination of the middle ear, as the author himself remarks, is usually neglected in making post-mortem examinations. So far as concerns the "practical point of view," nothing can be objected if the author is simply speaking of the indications for proper treatment. But at the close of our work we emphasized the fact that the objective examination of the ear in such cases might furnish important support for the *diagnosis* of pachymeningitis.

2. Böttcher protests against the various erroneous assertions concerning the relations of the aquæductus vestibuli and its connection with the saculi vestibuli, which have found reception in the text-books and journals. The great number of these errors forbids a detailed reference. But Böttcher is justified in reminding us that it was his investigations which first proved the connection of the aquæduct with both sacs, so that the importance of the same as an endolymphatic space originating from the epithelial labyrinthine vesicle was put beyond the question of doubt. The membranous portion of the aquæduct completely fills the bony canal, and consequently is not, as other authors urge, surrounded by a perilymphatic space. Just as little is there any communication of the perilymph with the dural space which the blind sac-like end of the aquæduct encloses.

3. Fränkel reports his various experiments at inoculation with the nasal secretion of a patient who had suffered for some time with simple ozæna. This girl, æt. seventeen, who had suffered since childhood with double otorrhœa, was treated with cotton tampons, by means of which the author was enabled to collect great quantities of nasal secretion. After the tampons had remained for two hours in the nose the secretion appeared like a clear neutral watery fluid, free from smell, and on microscopic examination showed only a few cellular elements and scattered micro-organisms. If the tampons remained for four hours, the secretion was more turbid, it smelt mouldy, and was slightly alkaline. If they remained from six to eight hours the secretion became dirty-yellow, and alkaline with an odor like the discharge in ozæna, while under the microscope it showed numerous cells and a large number of the lowest types of organisms in active

motion. The cells could be demonstrated partly as lymph-corpuscles and partly as structures like giant-cells, with numerous nuclei, which showed where subdivision had taken place, while other cellular bodies were discovered in a condition of regressive metamorphosis. When the micro-organisms had been tinted by the Koch-Ehrlich method, they could be distinguished as micro- and megalo-cocci, and further as delicate, slightly tinted, and coarser, deeply tinted rods. Transmission of the secretion to the nasal mucous membrane of rabbits (instilled or injected) did not produce any disease corresponding to rhinitis, nor did the introduction of the secretion beneath the eyelids produce any catarrhal conjunctivitis. But injections into the subcutaneous tissues were followed by fatal phlegmon. The author defends his former opinions concerning the fetor in the secretion against Bosworth, Herzog, and Bresgen, and insists once more that the micrococci can only give rise to fetor when they reach a nasal secretion which has undergone a change in its chemical composition by the disappearance of Bowman's glands. It is from this point of view also that the favorable action of the treatment by tampons can be explained. Fränkel, however, recommends that the tampons should be renewed every six hours in difficult cases, lest in them, also, the collected secretion should undergo decomposition. In less severe cases the tampons can be left in the nose overnight. These experiments prove further that the micro-organisms found in the secretion are not pathogenous. The fatal result in experiments with animals was due to septicæmic processes, for only a few bacteria were found in the blood, while in the pus of the animals it could not be proved that the rods had undergone multiplication.

Rhinitis atrophica occupies an exceptional position amongst diseases of the nasal mucous membrane, since it is rarely accompanied by a disease of the ear. But if from any reason an aural affection becomes associated with this type of rhinitis, it behaves in a most obstinate manner toward any and every treatment. Under such circumstances, therefore, the prognosis is rendered very much more unfavorable by the associated disease of the nose.

After describing the pharyngitis sicca which sometimes accompanies ozæna simplex, and usually makes its appearance with atrophy of the glands of the mucous membrane, Böttcher gives us an account of the post-mortem conditions in a man who had died of pernicious anæmia at the age of twenty-five, having suf-

ferred since childhood with an offensive discharge from the nostrils. The mucous membrane of the nostrils, both of which were very capacious, was reddened and partially slate-colored; both of the inferior turbinated bones were atrophic and discolored, whilst offensive masses of secretion were found in the nose. The most important alterations were visible on microscopic examination. The olfactory region showed remarkable changes, for Bowman's glands had for the most part disappeared, and the tissue of the mucous membrane had undergone infiltration with small cells, while both the vessels and nerves were normal and the epithelial layer preserved. The acinous glands in the respiratory tract were normal, but a portion of the mucous membrane in the same district was also infiltrated with small cells. No loss of substance could be detected.

Fränkel is therefore of the opinion that the destruction of Bowman's glands is the chief factor in the origination of the offensive odor; the function of the acinous glands of the respiratory tract alone does not suffice to protect the nasal secretion from the decomposing action of micro-organisms. The author finally describes the operative methods which have been recommended for the cure of ozæna: amongst others, scraping the nose with the sharp spoon, as practised by Bovel, as well as the total removal of the inferior, with partial resection of the middle, turbinated bone, which has been recommended by Volkmann. Fränkel prefers the milder action of the galvano-cautery to the scraping method. So far as concerns Volkmann's operation, which does not take proper account of the foundation and nature of the disease, since the disagreeable odor persists even after subsequent atrophy of the turbinated bones, further experience is demanded before we can ascribe to this method the effect of a radical cure.

II.—PATHOLOGY AND THERAPEUTICS OF THE EAR.

By A. HARTMANN, BERLIN.

Translated by J. A. SPALDING, M.D., Portland, Maine.

A.—GENERAL.

1. K. BÜRKNER, Göttingen. Progress in the treatment of diseases of the ear during the last ten years. *Arch. f. Ohr.*, vol. xix, p. 1.

2. L. JAKOBSON. Report of the aural patients examined and treated at Prof. Lucae's clinic, from April, 1877, to April, 1881. *Ibid.*, p. 28.
3. WAGENHÄUSER. Report of the aural clinic at Würzburg for the years 1880 and 1881. *Ibid.*, p. 55.
4. KIRK DUNCANSON. Report of the ear dispensary. *Edinburgh Med. Four.*, October, 1882.
5. AGNEW and WEBSTER. Clinical contributions to otology. These ARCHIVES, vol. x, p. 335.
6. R. SCHALLE, Hamburg. On aural and naso-pharyngeal diseases, and some of their methods of treatment. These ARCHIVES, vol. xi, p. 113.
7. VOLTOLINI. On the use of quinia in aural affections. *M. f. O.*, No. 10, 1882.
8. EULENSTEIN, Erlangen. Affections of the ear during the course of ilio-typhoid fever. *Inaugural Dissertation*, 1882.
9. WEIDENBAUM. On the diagnosis of deafness in recruits. *St. Petersburg med. Wochensch.*, No. 32, 1882.
10. VOLTOLINI. On the simulation of deafness. *M. f. O.*, No. 9, 1882.
11. MCBRIDE. The causes of tinnitus aurium. *Med. Times and Gazette*, Aug. 26, Sept. 16, 1882.
12. R. C. BRANDEIS. Two cases of tinnitus aurium, due to disturbances in the current of the cervical blood-vessels. These ARCHIVES, vol. xi, p. 155.
13. WALB, Bonn. Boracic acid as an antiseptic. *Centralbl. f. klin. Med.*, No. 34, 1882.
14. A. LUCAE. On disinfective precautions in the use of the air-douche. *Arch. f. Ohr.*, vol. xix, p. 132.
15. CRESWELL BABER. A waistcoat-pocket aural reflector and set of specula. *The Lancet*, Sept. 2, 1882.
16. GEORGE ABBOT. New aural forceps. *Ibid.*, Aug. 26, 1882.
17. BARATOUX. Audiometers. *Rev. mens. de laryng. d' otol.*, etc., No. 8, 1882.
18. A. BURCKHARDT-MERIAN, Basel. One hundred schematic tables for drawing the observed conditions of the ear. Benno-Schwabe's Verlag, Basel, 1883.
19. MOOS, Heidelberg. Etiology and condition of forty cases of congenital deafness. These ARCHIVES, vol. xi, p. 299.
20. F. KARSCH. Statistics of deaf-mutes in the Palatinate. *Friedreichische Blätter f. ger. Med.*, vols. ix and x, 1882.

21. J. A. CAMPBELL. Helps to hearing. 8vo., pp. 108. Chicago: Duncan Bros., Publishers, 1882.

22. L. TURNBULL. Importance of careful examination of the ears in effecting life insurance. *Virginia Med. Monthly*, Sept., 1882.

23. C. J. KIPP. Deafness accompanying sparkling synchysis of the vitreous. *Trans. Am. Otol. Soc.*, 1882.

24. R. C. BRANDEIS. Exhaustion versus inflation. *Trans. Am. Otol. Soc.*, 1882.

1. BÜRKNER's review of the progress in the treatment of diseases of the ear, in the last ten years, is about complete, and, on the whole, embraces all that is essential. But his judgments are not always to be assented to. Thus, in his description of paracentesis of the *Mt*, it would seem as if this operation were something that had been devised in the *last* ten years, while it is plain, even from Frank's old hand-book, that this operation was performed long ago, under about the same indications as to-day. Frank even recommended it in the case of small children, just as is now done by Bürkner. Beyond this, we must emphatically protest against Bürkner's criticism of electro-therapeutics: "On the whole, aurai surgeons are generally unanimous in rejecting the therapeutical value of electricity." In opposition to this we might quote what Erb says¹ of Brenner, that "his services cannot be diminished by the defective knowledge and jealous opposition of aurists of even the greatest renown, who would gladly rejoice if they could silence such important facts." Favorable results² from the use of electricity have been reported, especially by Hagen, Moos, Politzer, and Urbantschitsch.

2. JAKOBSON's report of the Berlin University Policlinic extends over a period of three years and a half. Preliminary remarks are made upon the value and defects of all statistical tables. Four thousand and seventy-nine patients with four thousand and seven forms of disease were treated. A few cases are reported in detail, amongst them one (No. 4) of a cancrroid of the ear, which was partially removed with the sharp spoon, but reappeared. It ceased, however, to spread after being repeatedly and thoroughly syringed, and then dusted over with *herba sabin. pulv. and alum. ust. pulv.*; ana. Amongst other cases we may notice two in which

¹ "Handbuch der Electrotherapie," 2te Hälfte, p. 620.

² See cases from V. Tröltzsch's Policlinic, *Arch. f. O.*, vol. xix, part 1, p. 58.

subjective noises were caused by muscular contractions. One of the patients complained of ringing in the ear whenever he nipped his eyelids together, while simultaneous incurvation of the *Mt* could be seen by the naked eye and demonstrated by the manometer. The ringing is to be referred to contraction of the tensor tympani muscle. The second patient heard a brief ringing, like *c*⁴, when he snapped his teeth together. When contracting the masticating muscles (the teeth being closed) he heard a roaring on both sides. The phenomenon was explained as depending upon some associated movement of the intrinsic muscles of the ear.

Lucae's method of testing the hearing with tuning-forks of various pitch, both by aërial and bone-conduction, is next cited, and Dennert's views especially criticised. Jakobson also regards a total and irregular diminution of the perceptivity for various tones of the scale, as diagnostic of disease of the sound-perceiving apparatus.

In case of regular diminution, or if lower tones are heard better than high, or inversely, with symmetrical decrease or increase, as we go up or down the scale, Jakobson thinks that it is impossible to make an accurate diagnosis between diseases of the sound-conducting and sound-perceiving apparatus. He lays less stress upon the comparison of aërial and bone-conduction than upon disproportional diminution of perception for high tones, which, in his opinion, allows us with great probability to diagnosticate nervous deafness. The prognosis in cases of the latter variety is very unfavorable.

The last pages of the report give the result of therapeutical experience, especially in the treatment of suppuration of the middle ear. In a great majority of these cases, especially in those which are acute, Prof. Lucae abstains from syringing and the use of the air-douche through the tubes. He is satisfied with simply cleansing the inner ear through the external meatus. The secretion is held in check by boracic acid, iodoform, and herba sabina with alum. Good results were obtained in cases of caries by the instillation of a one- or two-per-cent. solution of copper sulphocarbonate.

Jakobson reports beneficial results from the internal administration of gelsemium and paullinia. Fifteen to twenty drops of the tincture of the former were given in case of violent neuralgic pains, which were independent of the inflammatory symptoms;

while the latter was used in the form of powder (0.40) in case of headaches during the course of the ear-disease.

3. 307 ear-patients were treated at the Würzburg Policlinic in the years 1880, 1881. Amongst the clinical cases described, we may mention one of double othæmatoma, which, without apparent cause, developed itself at a symmetrical point on both auricles. A female patient complained of a roaring noise which was isochronous with the heart and objectively perceptible. It became much louder after resort to the catheter, and diminished after pressure on the carotid artery. After excluding all other possibilities, WAGENHÄUSER thinks himself justified in locating the original starting point of the noise in the internal carotid artery.

4. KIRK DUNCANSON simply gives statistics of the cases that he has treated.

7. VOLTOLINI, who has had great experience, thinks that it is a misdemeanor (!) to give large doses of quinia in intermittent fevers, on account of the possibility of producing quinine-amaurosis or deafness. He recommends smaller doses for longer periods, and assures us of obtaining better results.

8. The facts upon which EULENSTEIN's dissertation is founded were collected by Bezold in Ziemssen's clinic at the Munich hospital. After close examination for a year, no typhoid patient had ever shown the characteristic symptoms of catarrhal processes of the tubes, incurvation of the *Mt*, etc. Amongst 1,243 cases of typhoid, there were found 56 cases of diseases of the middle ear, divided as follows: 41 of suppuration, 2 of otitis media with tubal symptoms, and 7 of inflammation without perforation and without incurvation of the *Mt*. Nineteen cases showed sensitiveness over the mastoid process, and in five of these an incision had to be made. The author thinks that the affection of the middle ear is purely local,—though caused by the general affection,—and notices that it began about the twenty-fifth or thirty-fifth day of the fever, appearing, however, in three cases previous to the twentieth day. The prognosis is generally favorable.

The central or nervous form of the aural affection, with negative diagnostic points, is independent of the catarrhal process, and may be a sequence of blood-crisis or paresis of the nerve. Mention is also made of the inflammatory alterations in the labyrinth already demonstrated by Moos, as well as the deafness caused by various anti-pyretics.

9. WEIDENBAUM recognizes total deafness as well by the facial

expression and peculiarity of speech, as by suddenly awakening malingerers from sleep, or speaking to them while they lie in the incipient stages of chloroform narcosis. Deafness in moderate amount is proved by the usual methods of examination.

10. VOLTOLINI describes his method of discovering simulated one-sided deafness. He employs a large trumpet-shaped ear-tube, and puts it into the asserted deaf ear of the patient, while the healthy ear is left open. The simulation is discovered by the patient declaring that he cannot hear at all. In order to conceal, the deception still further, a *hollow* plug or tube of horn or rubber, through which the simulant can hear, may additionally be placed in the healthy ear. A case in which the simulation was thus demonstrated is appended.

11. MCBRIDE refers to the literature on the subject, gives full details of the causes of subjective noises in the ear, and comes to the following conclusions: 1. Hyperæsthesia of the auditory nerve is never the direct, but may be the predisposing, cause. 2. The ear ought to be examined in every case in which the cause of the noises is doubtful. 3. The noises can be caused under the greatest variety of circumstances, but auto-perception of the labyrinthine circulation is a very frequent factor. 4. In certain cases the ophthalmoscope may help us to decide by analogy whether the labyrinth is anæmic or hyperæmic. 5. The treatment, of course, depends upon the cause as deduced from the prevalent symptoms.

13. WALB experimented upon the antiseptic action of boracic acid, and discovered that it, to a certain degree, prevented putrefaction and the formation of mould. The experiments were made with freshly prepared fibrine free from hæmatoxylin. Without the addition of boracic acid, colossal bacteria were present, but there was no formation of mould; with a 0.2-per-cent. solution of the acid added, slight formation of bacteria, but no mould; with a 0.4-per-cent. solution, first the formation of mould, then the putrefaction, after which the mould underwent regressive metamorphosis.

When a 1-per-cent. or a stronger solution was added, the putrefaction was completely checked, while the formation of mould continued. Boracic acid, therefore, influences the formation of bacteria only, but not that of mould. Its use is consequently indicated in otitis externa, depending upon the formation of bacteria (as denoted by the smell of decomposition), while in otomycosis it is of no avail.

14. LUCÆ connects Zaufal's disinfection capsule for the air-douche directly with the silver catheter. For disinfection he resorts to boiling heat, letting the silver catheter remain all the time in boiling water.

15. BABER describes an ear-mirror and specula that can be carried in the waistcoat-pocket.

16. ABBOT'S ear-forceps are intended by their easier manipulation to be preferable to those commonly in use.

17. BARATOUX describes the audiometers previously employed, and mentions Boudet's as he has modified it. He retains the rheostat and telephone, but omits the microphone. An electric tuning-fork serves to interrupt the current. Baratoux has therefore simply returned to the arrangement which was made by the reviewer so far back as 1878.

18. BURCKHARDT-MERIAN sends us a little book containing on each leaf—which can easily be torn out—a picture of the *Mt* with horizontal and perpendicular sections of the organ of hearing, one for each ear. The idea is to use them for drawing the condition of the parts for clinical instruction and consultations, as well as for the aurist's own use in his note-books. They appear to us to be of great practical value.

20. KARSCH collected the statistics of 633 deaf-mutes in the Palatinate. Of these 340 were male, 293 female. 469 (75 per cent.) were normal, in a mental point of view; 110 (17 per cent.) weak-minded, but capable of education, and 54 (8 per cent.) more or less idiotic. Most of the latter were advanced in age. 325 cases (51 per cent.) were supposed to be congenital, 308 acquired. In about two thirds of the latter cases the deafness was referred to diseases of the brain. The epidemic, spinal meningitis, plays the chief rôle in these cases, for it was a widely spread disease in the Palatinate in the years 1864-5, 1871-2, and in 1874-5. 68 deaf-mutes had disturbances of sight, but no accurate examinations were made to discover pigmentation of the retina. A large number of the deaf-mutes were poorly developed, in a bodily point of view, 35 being rhachitic, and 38 scrofulous. In 9 marriages, which resulted in 11 deaf-mute children, the father was deaf in 7, the mother in 2, while in no case were the parents themselves deaf-mutes. There was only one case in which of the grandparents one (the mother of the father) was a deaf-mute, and in this case it was not stated whether her condition was congenital or acquired. Of those deaf-mutes who were still living, 10 with healthy wives

and 2 with deaf-mute wives had begotten 25 children. 22 unmarried and 5 married women with healthy husbands had borne 42 children. Of the 67 children with 5 grandchildren, not one was a deaf-mute, and of the 58 who were still alive there was not one that could be called really unhealthy. Particular attention is paid by the author to the influence of blood-relationship in the parents. In his statistics, also, the marriages of relatives are much more extensively represented than appears in the tables of percentages. Amongst the parents of deaf-mutes were found 63 (11 per cent.) who were as closely related as first or second cousins. These gave birth to children, 69 of whom were born deaf and 26 became deaf, *i. e.*, 14 per cent. of the entire list of deaf-mutes. 17 of the deaf-mutes were of low mental development, 5 incapable of being educated, 1 albino, 2 hemeralopic. Twelve of the others were otherwise diseased.

Eserichs' hypothesis that deaf-mutism is more frequent in older formations than younger has not been confirmed in the Palatinate. Nor is there any support in these statistics of Mayr's supposition, that the frequency of deaf-mutism stands in inverse ratio to the mortality in children. The social conditions of the deaf-mutes were very unfavorable, probably from their own extreme lack of development. We have mentioned the chief points of this paper, but are obliged for lack of space to refer our readers to the valuable original.

21. J. A. CAMPBELL. Though mainly intended for the laity, this little book contains in a condensed form some information which the practising otologist will find of value. He will be particularly interested in the description of the mechanical aids to hearing. All the forms of ear-trumpets are described and figured, and the principle of their action explained, as well as the audiophone, dentaphone, audinet, and osteophone. A description of the telephone is added. This is one of the few popular books which has a value and a *raison d' être*.
BURNETT.

22. TURNBULL calls attention to the fact that in this country the attention of insurance companies is not directed to ear-diseases to such an extent as their importance demands. Aside from the deaths which are likely to arise from the propagation of inflammation from the middle ear to the brain, there are those of accident to which the impaired hearing of the individual particularly exposes him. It is estimated that there is in this country one death from this cause alone every day. T. advises that the

following questions be answered by every applicant for life insurance : (1) Are you suffering from any form of disease of the ear ? (2) Have you pain, noises, or dizziness, or any discharge from the ear ? (3) Are you at all deaf ?

BURNETT.

23. KIPP has noticed that in a number of cases of sparkling synchysis there was deafness more or less complete in one or both ears.

BURNETT.

24. BRANDEIS. After enumerating some of the disadvantages and even dangers of Valsalva's and Politzer's methods of inflating the middle ear, as well as those attending the use of the catheter, B. recommends the employment of Siegle's pneumatic speculum as an exhaustor of the air in the meatus in certain cases where other means are not admissible or are attended with unpleasant results.

BURNETT.

B.—EXTERNAL AUDITORY MEATUS.

25. W. KIESSELBACH. Attempt to form an external auditory meatus in a case of congenital malformation of both auricles with absence of the external meatus. *Arch. f. O.*, vol xix, p. 127.

26. H. KNAPP. Congenital fibrous closure of the auditory meatus ; opening frustrated by hæmatophilia. *These ARCHIVES*, vol. xi, p. 19.

27. A. DUCAU. On a little-known cause of deafness. *Rev. mens. de laryng. et d' otol.*, No. 12, 1882.

28. A. DUCAU. A prune-stone lodged in the ear for thirty-three years. *Ibid.*, No. 7, 1882.

29. A. POLITZER. Parasitic inflammation of the external auditory meatus. *Wien. med. Wochensch.*, No. 29, 1882.

30. A. H. BUCK. A case of foreign body in the external auditory canal ; removal by displacement forward of the auricle and cartilaginous meatus. *New York Med. Record*, Dec. 16, 1882.

31. SAM'L THEOBALD. Complete closure of both external auditory canals following otorrhœa. *Trans. Am. Otol. Soc.*, 1882.

32. C. H. BURNETT. On the growth of aspergillus in the ear, with a case of the rare form of the parasite, the aspergillus glaucus. *Philadelphia Med. Times*, Nov. 4, 1882.

33. C. J. BLAKE. The progressive growth of the dermoid coat of the membrana tympani. *Am. Journal of Otol.*, Oct., 1882.

25. KIESSELBACH reports the case of a child aged six months, with a malformation of the auricle which, in the mother's opinion,

must have been due to pressure exercised by the umbilical cord. Both auricles were mutilated, the left more noticeably than the right. The tragus on the right side was very indistinct to the touch, while behind it lay a little hollow which appeared to designate the entrance to the external meatus. The operation was attempted upon this (right) side. Kiesselbach's motive in performing the operation was that, according to Bremer, this condition of the parts is probably not a simple rudimentary development, but one acquired in the early part of intra-uterine life by external pressure, so that it was quite possible "in a wholly horizontal position of the embryonal *Mt* that the external portion of the meatus does not undergo total closure." Inasmuch as the bony meatus may become developed in an incorrect direction, owing to the altered conditions of pressure and tension, operative interference at an early age appears justifiable. An incision into the hollow before mentioned led down to the subcutaneous fat. On pressing deeper inward to the periosteum no trace of any external meatus could be discovered. The incision was then extended to the lower edge of the squamous portion, from which a fine sound could be pushed into a narrow crevice. The latter was then enlarged forward and backward, until by examination with the sound, the annulus tymp. appeared to have been laid bare. A flap of skin from the auricle was pushed into the incision and fastened by sutures, one of which struck the trunk of the facial nerve. On the twelfth day after the operation the child was taken away by the mother, who was satisfied with what had been done, "for the child was much more sensitive to noises than before." This attempt to create an auditory canal may therefore be said to have miscarried.

27. DUCAU speaks of the frequent cases of contraction of the external meatus from wearing handkerchiefs over the ears, so that the auricles undergo constant compression. While v. Tröltsch believes that there are cases of relaxation of the fibrous filaments which fix the cartilage, Ducau thinks that the trouble lies in a flattening of the auricles against the skull, so that they become unfitted for collecting the waves of sound, whilst the tragus, which acts like a cover placed over the entrance to the meatus, offers further obstacle to the entrance of sound. Since instruments cannot long be borne, Ducau advises that a more permanent enlargement of the meatus be obtained by the introduction of laminaria bougies.

28. DUCAU reports the case of a plum-stone, which after remaining in the ear for thirty-three years, without causing any pain or inconvenience, was easily removed by syringing.

29. POLITZER briefly depicts the symptoms of otomycosis much in the same way as in his hand-book. The most reliable treatment is the use of rectified alcohol as recommended by Hassenstein. The alcohol is used twice daily, being poured into the ear after the removal of the fungoid masses, and allowed to remain at least fifteen minutes. If the remedy causes violent pain, it should be diluted with distilled water.

30. BUCK. The foreign body was a locust bean which had become firmly impacted in the bony portion of the meatus, but did not touch the *Mt*. All efforts to remove it through the meatus having proved futile, the auricle and cartilaginous meatus were moved forward, and a hook introduced at one side between the bean and the canal and there turned at right angles. Very forcible traction finally brought it away. The author is inclined to think that in this case the setting forward of the auricle was of but little advantage in getting at the foreign body, and that the removal was finally effected only because a greater amount of force was used than before. These beans are smooth and very hard, and no impression can be made on their surface unless the instrument be applied at right angles to the surface. Hence the difficulty in securing sufficient purchase for the hook to bring it away readily. A drawing of a hook suitable for such cases is given.

BURNETT.

31. THEOBALD. Upon each side of the normal meatus there was a cul-de-sac 2 *cm.* deep on the right side and 1.7 *cm.* on the left. Instead of either canal reaching to the *Mt*, they both terminated in a smooth concave floor which was covered with an integument continuous with that of the meatus. Loud voice was heard in the right ear at 6', in the left ear at 9'. Tuning-fork heard better in left ear.

BURNETT.

32. C. H. BURNETT. The *aspergillus glaucus* is the name given by Burnett to the form usually known as *A. flavescens*. He has seen only three cases of it. In treatment he has abandoned the alcoholic method, and now uses boracic acid, borax, boracic acid with chinoline, or with resercin.

BURNETT.

33. BLAKE. A series of experiments extending over a period of five years has shown that the growth of the dermoid layer of the *Mt* takes in general a certain definite direction. Thus,

five small discs of paper placed on the surface three above and two below the malleus handle, all finally reached the periphery upward and forward—never downward or backward. A diagram is given showing the path followed by each disc. BURNETT.

C.—MIDDLE EAR.

34. J. BARATOUX. On perforation of the membrana tympani, etc. *Rev. mens. de laryng.* etc., No. 11, 1882.

35. LUDWIG STACKE. On chronic suppurative processes in the middle ear, and their complications. *Inaugural Dissertation*. Rinteln, 1882.

36. THOMAS BARR. The treatment of certain forms of sup-puration of the middle ear. *Glasgow Med. Jour.*, No. 5, 1882.

37. OLIVER MOORE. Acute exacerbation of a chronic sup-purative inflammation of the middle ear, etc. These ARCHIVES, vol. xi, page 25.

38. S. MOOS. Œdema in the temporo-zygomatic region as a symptom of phlebitis and thrombosis of the lateral sinus. These ARCHIVES, this number.

39. S. MOOS. Pyæmic accidents in the course of and after the cure of an acute suppurative inflammation of the tympanum. These ARCHIVES, this number.

40. S. MOOS. Cholesteatoma of the mastoid process, with acute perforation into the external meatus after the use of Irish Roman baths. Perfect recovery. These ARCHIVES, this number.

41. EITELBERG. Cases of periostitis and caries of the mastoid process. *Wien. med. Pres.*, No. 46, 1882.

42. S. MOOS. Necrotic exfoliation of a bony semicircular canal (superior?), preceded for eight days by vertigo and vomit-ing. Recovery with loss of the previous remnant of hearing. These ARCHIVES, this number.

43. DESPRÈS. Otitis interna. Suppuration of the mastoid cells. Trephining. *Gaz. des hôpitaux*, No. 46, 1882.

44. H. KNAPP. Trephining of the mastoid in a case of otitis catarrhalis chronica, with intact membrana tympani. Opening of the transverse sinus. Recovery by first intention. These AR-CHIVES, vol. x, page 365.

45. T. H. GLUCK. A case of trephining of the pyramid of the petrous bone. *V. Langenbeck's Archiv*, vol. xxviii, page 556.

46. WEBER-LIEL. An apparatus for washing out masses of suppurative, thickened, or cholesteatomatous material from inacces-

sible, sinuous, and carious regions of the middle ear, and external auditory meatus. *M. f. O.*, No. 7, 1882.

47. T. M. PIERCE. A case of extensive disease of the left temporal bone with cerebral hernia. These ARCHIVES, vol. xi, page 313.

48. S. POLLOCK. An artificial membrana tympani made of elastic collodion. *St. Louis Med. and Surg. Jour.*, Oct., 1882.

49. H. KNAPP. On the treatment of aural polypi. *Trans. Am. Otol. Soc.*, 1882.

50. C. S. MERRILL. A case of acute middle-ear-inflammation, with death on the fourth day, from extension of the disease to the brain. *Trans. Am. Otol. Soc.*, 1882.

51. O. D. POMEROY. The use of soft india-rubber drainage-tubes in chronic suppurative inflammation of the tympanum, with narrowing or closure of the meatus externus. *Trans. Am. Otol. Soc.*, 1882. Reprinted in *Am. Jour. of Otol.*, Oct., 1882.

52. R. J. MCKAY. Aural polypus, facial paralysis, mastoiditis, and chronic meningitis, with recovery from the latter. *Trans. Am. Otol. Soc.*, 1882.

53. A. MATHEWSON. A case of abscess of the cerebellum following otitis media, months after apparent cure. *Trans. Am. Otol. Soc.*, 1882.

54. C. S. TURNBULL. Powdered boracic acid in the treatment of chronic purulent inflammation of the middle ear (otorrhœa). *Trans. Penn. State Med. Soc.*, 1882.

55. T. A. DOWNES. Chronic otitis media purulenta; its treatment in the Presbyterian Hospital, Philadelphia. *Am. Jour. of Otol.*, Oct., 1882.

56. C. H. BURNETT. Further observations on the usefulness of chinoline-salicylate in] otorrhœa. *Am. Jour. of Otol.*, Oct., 1882.

57. D. I. REYNOLDS. Otitis media purulenta. *Med. Herald*, Nov., 1882.

58. ERASTUS E. HOLT. Boiler-maker's deafness, and hearing in a noise. *Trans. Am. Otol. Soc.*, 1882.

34. BARATOUX gives a general view of the various sorts of perforations of the *Mt*, and the conditions with which they may be mistaken. The cure of perforation is next discussed. Atrophic spots and cicatrices can sometimes be distinguished from one another by the fact that the former are generally triangular, while the

cicatrices are round. Atrophic patches are usually situated in the superior and posterior portion of the *Mt*. Calcareous deposits and inflammatory processes on the opposite side indicate cicatricial formation. A case is communicated in which Baratoux was able to improve the hearing and stop the tinnitus, after repeated application of the galvano-cautery.

35. STACKE's dissertation contains a very comprehensive symptomatology of suppurative inflammations of the middle ear, and their complications, with abundant literary references. He communicates a case of suppurative otitis media with formation of cholesteatoma, which ended fatally by inciting meningitis and thrombosis of the sinus.

36. BARR pays attention to suppurative processes of the middle ear which resist the usual methods of treatment. He enters very minutely into those anatomical relations of the parts which tend to retain the products of suppuration in the upper portion of the tympanum and in the mastoid process, and consequently make these regions inaccessible to the usual therapeutic treatment as well as to syringing through the auditory meatus. Barr uses for this purpose a particular kind of syringe, which is depicted in the original. After removal of the deposits, Barr employs solutions of silver nitrate and insufflations of boracic acid. Three successful cases after this method are added.

41. EITELBERG communicates a case of caries appearing simultaneously in both mastoid processes, pleads urgently in favor of Wilde's incision, with subsequent removal of the sequestrum through the incision, and supports this by four additional cases. The opening in the mastoid process, when indicated in serious cases, should be done as Schwartz's urges, at the spot where spontaneous opening generally takes place. This situation, however, in opposition to Schwartz's theories, he found only twice in fifteen cases at the insertion line of the concha, and once just a trifle above the linea temporalis.

43. DESPRÈS describes a case of acute inflammation of the middle ear, otitis interna as he styles it, with violent pain and raging fever. The treatment in the preliminary stage was confined to syringing warm water into the nose. The case soon grew worse, with high fever, great swelling, and extension of the disease to the cells of the mastoid process. As Valsalva's experiment did not succeed, Desprès concluded that the *Mt* was not perforated. He thinks that the plan of catheterizing in cases of exudation in the

tympanum, as proposed by aurists, is perfectly useless. The mastoid process was trephined, and a large amount of laudable pus evacuated. The inflammatory symptoms underwent rapid retrogression. When the patient was discharged there was but a slight serous secretion from the mastoid incision. Flax-seed poultices were the only external application.

It appears to us that the views expressed by Desprès justify the unfavorable opinion of René de Calmette on the diffusion of otology in France, an opinion for which he was violently attacked by his fellow-countrymen.

45. GLUCK attempted on the cadaver to ligate the internal carotid in its canal, and succeeded in fifteen cases in chiselling out the artery in its whole course, without wounding the jugular vein or the transverse sinus. He therefore believes that, in conditions which demand trephining of the mastoid process, we can gain a more radical cure by resection of the pyramid of the temporal bone with the chisel. The author subsequently had an opportunity of proving in a case that such an operation was feasible. A patient with chronic suppuration of the middle ear was suddenly attacked, after previous and repeated hemorrhage from the right ear, with violent headache, sudden fainting, convulsions, and amaurosis, which were followed by a soporous condition, facial paralysis, and paralysis of the right arm. A collection of pus between the dura and pia maters, as a result of the otorrhœa and erosion of the internal carotid, appeared to be the probable condition, and was thus diagnosed. After chiselling away the posterior wall of the meatus, a portion of the mastoid process and of the temporal bone, the dura mater was extensively exposed, as a bluish, tightly-stretched, fluctuating sac. The dura mater was then opened, whereupon about 60 *gram.* of thick fetid pus which had lain between the dura and the pia escaped. The finger could be pushed up into the cavity as far as the internal occipital protuberance. Death ensued on the following night. At the post-mortem examination the dura mater was found sunken into the slightly concave surface of the brain upon the operated side, while its inner surface, from the longitudinal sinus to the base of the brain, was covered with an adherent layer of pus. The base of the skull was unaltered. There does not seem to have been any accurate examination of the ear, from which, however, the disease had its starting-place.

46. WEBER-LIEL cleanses the tympanum and its cavities with

v. Tröltsch's atomizing apparatus, to which small curved tubes are to be attached as necessity demands.

48. POLLOCK's patient was first placed in a perfectly horizontal position, and three drops of a solution of tannin in glycerine were instilled, and on top of that three drops of collodion. In a few minutes solidification was effected. It was a strong and solid membrane, and vibrated in Valsalva's experiment.

49. The substance of KNAPP's paper is incorporated in the author's article : "Report of 806 cases of ear-disease occurring in private practice," etc., published in the September number of these ARCHIVES for 1882.

50. MERRILL's patient was a man thirty-two years of age, affected for the first time with acute ear-catarrh. Death took place four days after the appearance of the first ear-symptoms. On examination after death, perforations were found through the roof of the middle ear and underneath the dura, and on it were a few drops of greenish pus. There was evidence of acute meningitis. BURNETT.

51. POMEROY. The closure of the meatus, preventing a ready outlet for the matter in the drum cavity, forms one of the greatest obstacles in treating certain forms of middle-ear disease. This is most commonly found, P. thinks, in children. To obviate this he uses drainage-tubes of rather soft rubber, beginning with the smaller sizes, but the largest which the meatus will admit. To introduce it, it should be stretched longitudinally by drawing it over a probe so as to diminish its transverse diameter. This is then carefully introduced until its end reaches the drum cavity, when the probe is withdrawn, and the tube returns to its normal diameter. The outer end of the tube is cut off close to the concha. The tube can be withdrawn at any time by means of a forceps. Under the lateral pressure exerted by the tube, the swelling of the canal usually gives way and the tube becomes loose. It must then be replaced by a larger one. Through these tubes the middle ear can be easily cleansed and any desired medication carried out. Seven cases in which it was used with benefit are related. BURNETT.

In the discussion which followed the reading of the paper, some members, including the President (Dr. J. O. Green), and Dr. Knapp, expressed a preference for a silver tube in drainage of the middle ear. BURNETT.

52. MCKAY. In addition to his other troubles, the patient had a papillitis of the left eye, and there was considerable congestion of the right disc. BURNETT.

53. MATHEWSON's patient was a child eleven years of age, whose left ear was affected with a necrosis of the mastoid and a purulent discharge. Under treatment these symptoms disappeared, and the child was discharged cured in December, 1880. On the 14th of March, 1881, there appeared suspicious head-symptoms, but on examination, the ear was found about as it was when the patient was discharged. The O. S. showed some fulness of the retinal veins, but nothing else abnormal. After a brief convulsion the child died on the 16th of March. On post-mortem examination, the veins and sinus were found filled with fluid blood; there was injection of the meninges, and adhesions at points over the petrous portion of the temporal bone. Some pus under the dura, over the tegmen tympani, and in the sheath of the 5th pair, and an abscess containing an ounce of fetid pus in the left lobe of the cerebellum.

BURNETT.

54. Since TURNBULL has adopted the boracic-acid treatment for purulent inflammation, it has become a pleasure to him to handle such cases, so uniform has been his success in treating this class of diseases which before had been to him only objects of despair.

BURNETT.

55. DOWNES. The cases, four in number, were under the charge of Dr. C. H. Burnett. The syringe is used for cleansing when the discharge is abundant, and cotton on a probe when it is scant, and powdered calendulated boracic acid blown in in just sufficient quantity to cover the diseased surface.

BURNETT.

56. C. H. BURNETT finds the salicylate of chinoline, concerning which he first wrote in vol. iv, No. 2, of the *American Journal of Otology*, a valuable adjuvant to boracic-acid powder.

BURNETT.

57. REYNOLDS believes in constitutional treatment in addition to local. The latter consists principally in the application of Listerine (a compound of boracic acid, eucalyptus oil, thymol, and some other less important substances), after a thorough cleansing of the parts by means of the syringe and the catheter.

BURNETT.

58. Among the men employed in the steam-boiler factory at Portland, Me., forty were hard of hearing and examined by Dr. Holt. He found the deafness due to changes of a catarrhal nature in the sound-conducting apparatus, the incessant noises agitating the chain of ossicles and producing more or less ankylosis in their joints. Bone-conduction in these patients was as good as in normal ears. The better hearing in noises, which was

claimed by over 100 of his patients, was subjected to various tests, and proved, according to the author, to be a self-deception, based upon the raising of the voice, which the speakers in a noise did instinctively. The noise never improved the hearing in any of the cases that had been tested.

BURNETT.

D.—NERVOUS APPARATUS.

59. BRUNNER. A case of complete unilateral deafness after mumps, etc. These ARCHIVES, vol. xi, p. 102.

60. J. SEITZ. Deafness after mumps. *Corresp. f. Schweiz Aerzte* No. 19, 1882.

61. E. J. MOURÉ. Case of total deafness after mumps. *Rev. mens. de laryng. d' otol.*, etc., No. 10, 1882.

62. Extensive fracture of the base of the skull in an infant. Escape of cerebro-spinal fluid from the ear. *Medical Times*, No. 1684, 1882.

63. WILLIAM JAMES. Sense of dizziness in deaf-mutes. *Amer. Jour. of Otol.*, Oct., 1882.

60. SEITZ communicates a case of deafness after mumps which is analogous to that of Brunner. The patient was a student aged nineteen, in whom deafness had appeared on the right side thirty-six hours after an attack of mumps, which had ceased on the sixth day. The deafness was accompanied with a loud roaring and rushing sound, a metallic clang with every perception of sound, together with excessive vertigo and difficulty in walking. The objective condition was negative and treatment of no avail.

61. MOURÉ mentions previous observations of deafness after mumps, and adds one more to the list. A girl eight years old was attacked on the fifteenth day of the disease, just when the swelling of the glands had begun to disappear, with total deafness on both sides.

Pain and other symptoms were absent. Roaring in the ears appeared a short time later. The examination of the ear showed nothing abnormal. Treatment was of no avail. Disturbances of the equilibrium were not noticed.

62. A child aged one year and seven months fell from his bed, about two feet high, and fractured the base of his skull. He died on the sixth day from lepto-meningitis. During this time blood, and particularly cerebro-spinal fluid, escaped from the left ear.

The fracture affected the middle of the left parietal bone, from

which it reached to the external meatus, and along its upper walls to the annulus tympanicus. It here divided into two fissures, one of which extended through the internal auditory meatus to the jugular foramen, the other into the region of the foramen ovale. The petrous bone itself was not more closely examined. Leaving aside the rarity of such fractures in the tender age of childhood, the author insists that such injuries of the external auditory meatus should be carefully treated with antiseptics (at first syringing with a five-per-cent. solution of carbolic acid, and later with an iodoform bandage or Lister gauze), on account of the communication which exists, in all such cases, between the external air and the arachnoidal space, especially so soon as the fracture extends as far as the posterior wall of the pyramid.

63. JAMES. Of 519 deaf-mutes subjected to the test, 186 are reported as not being made dizzy by a rapid whirling of the head in any direction; while of 200 students with normal ears, tested similarly, only one remained exempt. Of those deaf-mutes which are reported as dizzy, 134 were said to be so only in a slight degree, 199 normally so, and a few cases abnormally so. Forty-three were subjected to the test of a galvanic current passed through the head. The current, which caused four normal adults to bend the head and body strongly over, produced the same effect in only six among fifty-eight of the class "not dizzy," while in twenty-three of the class "dizzy," fifteen were affected in a greater or less degree. It was also endeavored to learn how far the deaf-mutes were affected with sea-sickness; and though the report is not very full, what evidence we have seems to lead to the opinion that they are not so much affected as those with normal ears. Attention is called to another phenomenon which seems to point to the semicircular canals as forming an important factor in the function of orientation. Deaf-mutes, as a rule, when their heads are under water, and the effect of gravitation is lost, experience an indescribable feeling of alarm and bewilderment. This is particularly so when the eyes are closed. The paper is a very suggestive one, and it is hoped others will follow out the lines of experiment so well laid out by the author.

BURNETT.

E.—NOSE.

64. W. J. WALSHAM. The treatment of deflection of the nasal septum. *The Lancet*, Sept 23, 1882.

65. ARTHUR HARTMANN. Partial resection of the nasal

septum in cases of excessive deflection. *Deutsch. med. Wochenschr.*, No. 51, 1882.

66. J. GRUBER. A case of inflammation of the naso-pharyngeal mucous membrane from the presence of a cherry-stone in the nostril. *M. f. O.*, No. 7, 1882.

67. ARTHUR HARTMANN. Supra-orbital neuralgia produced by empyæma of the accessory cavities of the nose, owing to the hindrance of the escape of the secretion from the middle nasal meatus. *Berl. klin. Wochenschr.*, No. 48, 1882.

68. CRESWELL BABER. Remarks on adenoid vegetations of the naso-pharynx. *Brit. Med. Journ.*, August 5, 1882.

64. WALSHAM has repeatedly and successfully performed Adams' operation for straightening the nasal septum. If the septum is too resistant, a star-shaped incision can be made through the mucous membrane and cartilage. Walsham then proposes to push a narrow knife beneath the mucous membrane, and to divide the cartilage subcutaneously. In this way he thinks that we can better avoid all loss of substance with perforation of the septum.

65. HARTMANN has operatively removed a portion of the nasal septum in three cases of excessive curvature. He operated in two of the cases in order to facilitate the complete removal of nasal polypi, and in the third on account of epilepsy. In two of the cases the prominence was removed with narrow bone-scissors; in the third an incision made with the scissors, and the prominence removed with a chisel applied in a sagittal direction. The septum was not perforated in any of the cases. The hemorrhage was very abundant in the first two cases, and caused considerable time to be lost in the operation. Chloroform was invariably given, and the operation done under artificial illumination.

66. GRUBER'S interesting case was as follows: A woman, æt. twenty-nine, had suffered for a long time from the symptoms of chronic coryza, with intermittent pain in the head, eyes, and in the left ear. The middle ear showed the symptoms of hypertrophic inflammation, against which the air-douche was useless. The rhinoscopic condition was negative. Catheterism was repeatedly performed during a period of six weeks, without meeting with any obstacle, until one day resistance was felt. The catheter had struck a foreign body in the pharynx, which was discovered to be a cherry-stone covered with secretions

After removal of this foreign body the catarrh and subjective symptoms disappeared.

67. HACK was the first to observe that supra-orbital neuralgia may be a purely reflex symptom of disease of the nasal cavities, and HARTMANN now gives us two cases in which the neuralgia was caused by an affection of the accessory cavities of the nose. In both cases polypoid swelling of the external portions of the middle nasal meatus hindered the discharge of the secretion from the accessory cavities. Cure was obtained by removing the polypi. The diagnosis of an affection of the cavities in question can generally be supported by the favorable action of Politzer's experiment. The characteristic symptom in such cases is the welling up of thick, fluid pus, when the contracted entrance to the middle nasal meatus, between the middle and inferior turbinated bones, is enlarged with a thick sound.

68. BABER is of the opinion that tonsillotomy should be done before removing adenoid growths by an operation ; cauterization of the growths is of no use. At night, the patient ought to wear Guye's contra-respirator.

ABSTRACTS FROM THE OTOLOGICAL PAPERS
READ BEFORE THE AMERICAN MEDICAL
ASSOCIATION, AT ITS MEETING IN CLEVELAND, O., JUNE 5, 6, AND 7, 1883.

The following abstracts are taken from the report on the section of ophthalmology, otology, and laryngology, of the American Medical Association, published in *The Medical Record*, June 16, 1883.

In the absence of the Chairman, Dr. A. W. Calhoun, of Atlanta, Ga., Dr. J. J. Chisolm, of Baltimore, was elected president *pro tem*.

Dr. LAWRENCE TURNBULL, of Philadelphia, read a paper on *paralysis of the facial nerve in connection with diseases of the ear*. Acute and chronic disease of the middle ear will give rise to paralysis, alteration in taste, touch, smell, gait, and vision; further, to epileptiform convulsions, hemiplegia, and insanity. He cites four cases of facial paralysis due to ear disease, of which the first is of particular interest, as the paralysis resulted from a malignant intra-aural tumor, which originally was a polypus, and ultimately caused death by involving the brain.

Dr. W. J. JARVIS, of New York, on *tonsillotomy without hemorrhage*, distinguishes two kinds of hypertrophied tonsils: (a) the ordinary soft variety, which should be removed with the tonsillotome, by preference, and (b) the hard or scirrhus tonsil, which bleeds readily, and should be removed with the ecraseur. In one such case, before it had come under his care, the scissors and tonsillotome had been used by different surgeons, and each attempt had been followed by alarming hemorrhage. He removed both tonsils with the ecraseur. The operations proved bloodless, caused but slight discomfort, but were tedious, each occupying three hours.

A paper on *the action of nitrate of silver on the mucous membrane*

of the throat, by Dr. C. SEILER, of Philadelphia, who advocated very strong solutions, from 20% to 50%, and the solid stick, gave rise to an extended discussion on the application of that remedy, without bringing out any new points.

Other papers were :

On myringitis. By C. WILLIAMS, of St. Paul, Minn., read by title.

On the tinnitus aurium, and the deafness accompanying Bright's disease. By Dr. LAWRENCE TURNBULL.

On nasal disease, the frequent cause of asthma. By Dr. J. O. ROE, of Rochester.

On the appearance of the diseased mucous membrane of the nose and throat of adult patients.

MISCELLANEOUS NOTES.

The committee of organization for the *Third International Otolological Congress*, Dr. Burchhardt-Merian (Basel), president ; A. Hartmann (Berlin), L. Loewenberg and Ménière (Paris), had a meeting in Paris, on March 18th, and concluded to abide by the decision of the Second Congress, to hold the session of the third in Basel, Switzerland, the first week in September, 1883. The committee enlarged their number by the following gentlemen : Dalby and Urban Prichard, of London ; Roosa, of New York, and Blake, of Boston.

A French Otological and Laryngological Society has been founded under the title : *Société Française d' Otologie de Laryngologie*, consisting thus far of 18 members from Paris, 13 from the French provinces, and 9 associated members from other countries. The Society will meet three times a year, viz.: in January and October (ordinary sessions), and in the Easter week (general session). It will publish its transactions. The conditions for membership are :

1. A diploma of M.D.
2. A written application accompanied by a printed essay and a MS. paper on some subject connected with otology or laryngology.

The only disciplinary measures mentioned in the By-Laws are : expulsion if a member fail to pay his annual dues after two official notices.

Communications to be addressed to the Secretary, M. le Dr. Baratoux, 12 rue Condorcet, Paris.